Comp

PROCEEDINGS

OF

THE CHEMICAL SOCIETY.

Vol. XXVIII. Nos. 395—408.

JANUARY—DECEMBER, 1912.

LONDON:

GURNEY & JACKSON, 33, PATERNOSTER ROW.

1913.

RICHARD CLAY AND SONS, LIMITED
BRUNSWICK ST., STAMFORD ST., S.E., AND
BUNGAY, SUFFOLK.

LIST OF GRANTS MADE FROM THE RESEARCH FUND DURING THE YEAR 1912.

£15 to F. W. Atack: action of metallic salts in their lower states of oxidation, and of other reducing agents, on typical dyestuffs and coloured substances.

£5 to S. D. Adshead: preparation of *o*-carboxyphenylsuccinic acids,

£5 to G. Barger and F. H. Carr: constitution of aconitine.

£15 to T. V. Barker: studies in co-ordination, isomorphism, and valency.

£5 to E. de B. Barnett: studies in the indene and fluorene series.

£7 to G. Blackstock: condensation of butylene bromide with ethyl sodiomalonate.

£5 to O. L. Brady: constitution of aconitine.

£10 to J. C. Cain: santalin, and the chemistry of diphenyl derivatives.

£8 to F. D. Chattaway: polymerism amongst the hydrazides and anilides (continued).

£5 to R. W. L. Clarke: constitution of picrotoxinin.

£5 to J. B. Cohen: bromination of toluene.

£5 to C. R. Crymble: absorption spectra of the organo-metallic derivatives.

£5 to J. C. Duff: preparation of substituted indigos.

£10 to A. E. Dunstan: relation between viscosity and chemical constitution (continued).

£8 to R. G. Fargher: condensation of ethyl sodiobenzoylacetate with 1 : 3-dibromobutane.

£5 to J. Ferns: preparation and properties of sulphonic esters (continued).

£7 to J. B. Firth: sorption of simple and mixed gases by charcoal.

£10 to F. C. Garrett: ignition of mixtures of the paraffin hydrocarbons and air under varying conditions.

£5 to N. Hall: derivatives of some α-ketonic acids.

£5 to R. T. Hardman: electromotive forces in alcohol (continued).

£12 to W. N. Haworth: synthesis of cantharene and camphenic acid.

£5 to C. Hollins: synthesis of norpinic acids.

£8 to E. Hope: condensation products of nitromeconine with cotarnine.

£10 to E. Hope: condensation of certain sodium derivatives with unsaturated esters.

£8 to A. Hopwood: synthesis of naphthyltyrosine and of polypeptides (continued).

£5 to J. Kenner: reactions of derivatives of 2 : 2′-ditolyl.

£5 to J. Kenner: investigation of the reactions of diphenyl-2 : 3 : 2′ : 3′-tetracarboxylic acid.

£10 to F. R. Lankshear: studies of epicamphor and its derivatives: electrolytic reduction of various diketones and aldehydes (continued).

£5 to F. R. Lankshear: investigation of absorption spectra.

£10 to J. W. McBain: chemical nature and physical properties of dental amalgams.

£6 to G. Martin: relation of boron compounds to silicon compounds.

£5 to F. A. Mason: oxidation of the methosulphates.

£8 to P. May: some problems of tautomerism.

£8 to R. W. Merriman: azeotropic mixtures of the lower alcohols with water.

£5 to J. E. Myers: experiments on the effect of centrifugal force on various chemical equilibria.

£5 to M. Nierenstein: investigation of hemlock tannic acid and of Knoppen tannic acid.

£10 to W. R. Pratt: preparation of saturated and unsaturated ketones from *iso*propyldihydroresorcin.

£10 to R. Robinson: synthesis of *iso*quinoline alkaloids (continued).

£5 to R. Robinson: stereochemistry of the triphenylmethane group.

£10 to H. Rogerson: synthesis of β-furancarboxylic acid, and the preparation of the β-substituted compounds of pyrrole and thiophen.

£5 to D. Segaller: velocity coefficients of some iodo-compounds with sodium phenoxide in alcoholic solution at various temperatures (continued).

£10 to Clarence Smith: (1) pyrogenic decomposition of organic alcohol and animal substances; (2) investigation of liquid racemates; (3) keto-enol tautomerism of α-hydrogenated carboxylic acids.

£5 to S. Smith: the bromoxylenol obtained by the action of phosphorus pentabromide on dimethyldihydroresorcin (continued).

£6 to V. Steele: investigation into the terpene derived from carvone.

£5 to T. R. Stopford: preparation of butyrolactone and 1 : 4-dibromobutane.

£12 to F. B. Thole: relation between viscosity and chemical constitution.

£8 to E. R. Thomas: influence of the constitution of tertiary bases on the rate of formation of quaternary ammonium salts.

£5 to A. Wallace: preparation of anhydrous allyl alcohol.

£10 to C. R. Young: derivatives of 1-methoxy- and *d*-dimethoxy succinic acids.

Total amount granted during 1912 = £361. 0. 0.

LIST OF FELLOWS ELECTED DURING 1912

Name.	Proposed.	Elected.
Allcock, Thomas	April 18th, 1912	June 20th.
Arkell, Daniell, B.Sc.	March 7th, 1912	May 2nd.
Amies, Edwin John, B.Sc.	June 20th, 1912	December 5th.
Backer, Hilmar Johannes	December 7th, 1911	February 15th.
Bailey, Clement William, M.Sc.	January 18th, 1912	,, ,,
Bailey, William Llewelyn	June 20th, 1912	December 5th.
Baker, James Henry Young	November 7th, 1912	,, ,,
Barnett, Raymond Theodore Fred, B.Sc.	April 18th, 1912	June 20th.
Barrow, Fred, M.Sc., Ph.D.	December 21st, 1911	February 15th.
Bartow, Arthur Leslie	February 15th, 1912	May 2nd.
Bearder, Ernest Arthur, M.Sc.	December 7th, 1911	February 15th.
Bews, Charles James Vinall, B.Sc.	April 18th, 1912	June 20th.
Birks, Cyril Douglas	May 2nd, 1912	,, ,,
Blackstock, Gibbs, B.A.	December 7th, 1911	February 15th.
Bones, Arthur Anderson	March 21st, 1912	May 2nd.
Bowack, Douglas Anderson	November 7th, 1912	December 5th.
Bowater, William Henry	May 2nd, 1912	June 20th.
Bridge, James Ewart, B.Sc.	January 18th, 1912	February 15th.
Brindle, Harry	April 18th, 1912	June 20th.
Brownlie, David, B.Sc.	December 21st, 1911	February 15th.
Brunjes, Thomas Alfred	,, ,, ,,	,, ,,
Bunker, Sidney Waterfield, B.Sc.	,, ,, ,,	,, ,,
Bryant, Ernest Gower	February 15th, 1912	May 2nd.
Buckle, Edmund Arthur	June 20th, 1912	December 5th.
Bury, Charles Rugeley, B.A.	February 15th, 1912	May 2nd.
Campbell, Alfred Varlow	May 2nd, 1912	June 20th.
Campbell, Arthur Fred, M.Sc.	,, 16th, 1912	,, ,,
Chakraborty, Jatindranath, B.A.	April 18th, 1912	May 2nd.
Challinor, Richard Westman	November 7th, 1912	December 5th.
Chatterji, Bamacharan, M.A.	May 2nd, 1912.	June 20th.
Cheshire, Frank Lothian	April 18th, 1912	,, ,,
Clark, Leslie Melville	May 16th, 1912	,, ,,
Clarke, William Thomas, B.Sc.	January 18th, 1912	February 15th.
Colclough, Tom Peach, M.Sc.	December 21st, 1911	,, ,,
Coombs, Frank Andrew	November 7th, 1912	December 5th.
Cooper, Evelyn Ashley, B.Sc.	March 7th, 1912	May 2nd.
Crowther, Raymond Edwin	,, 21st, 1912	,, ,,
Curtis, Frederic Fernandez	December 7th, 1911	February 15th.
Dallas, William	March 21st, 1912	May 2nd.
Das, Bhupati Nath, M.A., B.Sc.	May 16th, 1912	June 20th.
Davys, Gerard Irvine, B.A., M.D., B.Ch.	,, ,, ,,	,, ,,
De, Surendranath	January 18th, 1912	February 15th.
Dick, Thomas Sharp	November 16th, 1911	,, ,,
Dieffenthaller, George Cruden	May 2nd, 1912	June 20th.

Name.	Proposed.	Elected.
Dixon, Walter Henry	November 7th, 1912	December 5th.
Dodds, Herbert Henry, M.Sc.	,, ,, ,,	,, ,,
Dodson, Harold Forster	,, 16th, 1911	February 15th.
Douglas, James Crawford	,, 21st, 1912	December 5th.
Douglas, Robert Percy	February 1st, 1912	May 2nd.
Duncan, John	December 21st, 1911	February 15th.
Dutta, Jatindra Mohan, M.A.	May 16th, 1912	June 20th.
Dyson, James Harry	June 6th, 1912	December 5th.
Eastick, Frederick Charles, B.A.	March 7th, 1912	May 2nd.
Ellis, Ridsdale, B.Sc.	June 20th, 1912	December 5th.
Ellis, Rowland Holliday	December 7th, 1911	February 15th.
Elsdon, George Davidson, B.Sc.	November 7th, 1912	December 5th.
Evans, Elliott Alfred	February 1st, 1912	May 2nd.
Farlie, John Burke, jun	March 7th, 1912	,, ,,
Fergusson, Donald MacEachern	May 16th, 1912	June 20th.
Fleet, Wilfred James	January 18th, 1912	February 15th.
Foster, Alfred George Ernest	April 18th, 1912	June 20th.
Frankland, Edward Percy, B.A., Ph.D., M.Sc.	February 1st, 1912	May 2nd.
Gadd, Sydney Charles	June 6th, 1912	December 5th.
Gajjar, Madanlal Jekisandas, M.A.	April 18th, 1912	June 20th.
Gallogly, Michael Francis, B.A.	,, ,, ,,	,, ,,
Garbutt, Cornelius Durham	December 21st, 1911	February 15th.
Gaul, Ernest George, M.Sc.	November 16th, 1911	,, ,,
Ghosh, Jyotish Chandra	December 21st, 1911	,, ,,
Gibbins, Richard Ernest	,, ,, ,,	,, ,,
Glegg, Robert, B.Sc.	April 18th, 1912	June 20th.
Gray, Harold Heath, B.Sc.	November 7th, 1912	December 5th.
Grützmacher, Frederick Lyle	,, 21st, 1912	,, ,,
Haines, Thomas Sidney	December 7th, 1911	February 15th.
Hale, Arthur James, B.Sc.	June 20th, 1912	December 5th.
Harding, Leonard	May 2nd, 1912	June 20th.
Hartley, Harold, M.Sc.	,, 16th, 1912	,, ,,
Hatherly, Henry Medley	,, ,, ,,	,, ,,
Hawkins, Walter Elmslie, B.Sc.	February 1st, 1912	May 2nd.
Haydon, Archie	June 20th, 1912	December 5th.
Heilbron, Isidor Morris, Ph.D.	January 18th, 1912	February 15th.
Henius, Max, Ph.D.	May 16th, 1912	June 20th.
Heron, Harold	,, 2nd, 1912	,, ,,
Hill, James Grainger	February 15th, 1912	May 2nd.
Holden, Edmund Haworth, M.Sc.	April 18th, 1912	June 20th.
Hope, Edward, M.Sc.	June 20th, 1912	December 5th.
Howells, Oliver Richard, B.Sc.	March 7th, 1912	May 2nd
Hughes, John Owen, B.Sc.	February 15th, 1912	,, ,,
Jamas, Ardesir Naserwanji Peston, M.A., B.Sc.	November 7th, 1912	December 5th.
James, Charles	January 18th, 1912	February 15th.
James, Edward Lewis	May 16th, 1912	June 20th.
James, Edwin Oliver	April 18th, 1912	,, ,,
Jewell, William	May 16th, 1912	,, ,,
Jobling, Edgar, B.Sc.	November 7th, 1912	December 5th.

Name.	Proposed.	Elected.
Jones, Edgar Dingle	February 15th, 1912	May 2nd.
Jones, Richard Arnold Seymour-, M.Sc.	,, ,, ,,	,, ,,
Keenan, Thomas John	May 2nd, 1912	June 20th.
Knox, Archibald	March 21st, 1912	May 2nd.
Komatsu, Shigeru	June 6th, 1912	December 5th.
Kuntzen, Harold Eric	April 18th, 1912	June 20th.
Lacey, Edwin Charles, B.Sc.	March 21st, 1912	May 2nd.
Lampitt, Leslie Herbert, M.Sc.	,, ,, ,,	,, ,,
Langton, Harold McKee, B.Sc.	April 18th, 1912	June 20th.
Lankshear, Frederick Russell, B.A., M.Sc.	November 7th, 1912	December 5th.
Lenfestey, Harold John de Quetteville	February 1st, 1912	May 2nd.
Levy, Stanley Isaac, B.A., B.Sc.	November 7th, 1912	December 5th.
Lomax, Ernest Lawson, M.Sc.	,, ,, ,,	,, ,,
Lucas, William Thornton, B.A.	February 15th, 1912	May 2nd.
Macdonald, James Leslie Auld, B.Sc	April 18th, 1912	June 20th.
McMillan, William	December 7th, 1911	February 15th.
McMyn, James William	January 18th, 1912	,, ,,
Masani, Nadirshaw Adarji, M.A., B.Sc.	April 18th, 1912	June 20th.
Maxwell, Francis	June 20th, 1912	December 5th.
Meadon, Percival Edward, B.A.	May 2nd, 1912	June 20th.
Meister, Frederick James	,, 16th, 1912	,, ,,
Menon, Ambat Kesava, B.A.	February 1st, 1912	May 2nd.
Menzies, Robert Charles	May 16th, 1912	June 20th.
Middleton, Herbert, M.Sc.	November 16th, 1911	February 15th.
Milbourne, Robert John	March 21st, 1912	May 2nd.
Modi, Pestanji Manekji, B.A.	January 18th, 1912	February 15th.
Morgan, Sidney	May 16th, 1912	June 20th.
Morrell, George Francis, Ph.D., B.Sc.	November 7th, 1912	December 5th.
Mumford, Ernest Moore, B.Sc.	,, ,, ,,	,, ,,
Myers, Ernest Meyer	December 7th, 1911	February 15th.
Natrajan, Tanjore S.	November 21st, 1912	December 5th.
Naunton, William Johnson Smith, B.A., B.Sc.	December 7th, 1911	February 15th.
Neilson, Richard Gillies	January 18th, 1912	,, ,,
Newman, Leslie Frank, B.A.	November 7th, 1912	December 5th.
Nichols, William Moore	,, ,, ,,	,, ,,
Nierenstein, Maximilian, Ph.D.	,, ,, ,,	,, ,,
Nowak, Carl Alfred, B.Sc.	,, 21st, 1912	,, ,,
Ogilvie, James Pettigrew	December 7th, 1911	February 15th.
O'Mara, James, B.A.	March 7th, 1912	May 2nd.
Orange, Lionel, B.Sc.	November 7th, 1912	December 5th.
Painter, George Macaulay, B.Sc.	February 1st, 1912	May 2nd.
Paniker, Ramni, M.A., M.Sc.	June 6th, 1912	December 5th.
Parkes, John Wilfrid	January 18th, 1912	February 15th.
Patterson, John William	November 7th, 1912	December 5th.
Pearson, George Ernest	May 16th, 1912	June 20th.
Pope, Rupert William, B.Sc.	December 21st, 1911	February 15th.
Potter, Charles Etty, B.Sc.	November 7th, 1912	December 5th.
Potter, Howard Vincent	December 21st, 1911	February 15th.

Name.	Proposed.	Elected.
Raitt, William	December 7th, 1911	February 15th.
Rakshit, Jitendra Nath	November 7th, 1912	December 5th.
Rayner, Edgar Alexander, B.Sc.	January 18th, 1912	February 15th.
Remers, Martin, L.R.C.P., L.R.C.S.	November 7th, 1912	December 5th.
Rennie, John	March 7th, 1912	May 2nd.
Rideal, Eric Keightley, B.A.	May 2nd, 1912	June 20th.
Roberts, Alfred Reginald	December 21st, 1911	February 15th.
Roberts, Walter Morrell, M.Sc.	,, 7th, 1911	,, ,,
Roper, Herbert Carr	June 20th, 1912	December 5th.
Sasson, Albert	November 7th, 1912	December 5th.
Scarborough, Harold Archibald, B.Sc.	,, ,, ,,	,, ,,
Scott, Walter	,, ,, ,,	,, ,,
Seal, Kunjo Behary	,, ,, ,,	,, ,,
Shaw, William Daveridge Hamilton, B.Sc.	May 16th, 1912	June 20th,
Shute, Henry Alfred, B.Sc.	February 1st, 1912	May 2nd.
Singh, Bawa Kartar, B.A.	,, 15th, 1912	,, ,,
Sircar, Anakul Chandra, M.A.	May 16th, 1912	June 20th.
Sladden, Cyril Edgar, B.A.	November 7th, 1912	December 5th.
Smart, Bertram James, B.Sc.	December 7th, 1911	February 15th.
Smith, Henry Edgar, M.Sc.	January 18th,1912	,, ,,
Smith, Richard	December 21st, 1911	,, ,,
Smith, Thomas Alfred, B.Sc.	November 7th, 1912	December 5th.
Smith, William Charles	,, ,, ,,	,, ,,
Steele, Victor	,, ,, ,,	,, ,,
Stephen, Alfred Ernest	,, ,, ,,	,, ,,
Strivens, Percy Rudolph	January 18th, 1912	February 15th.
Thévenaz, William, D. és Sc.	May 16th, 1912	June 20th.
Thomas, William Leonard	,, ,, ,,	,, ,,
Thompson, Arthur	March 7th, 1912	May 2nd.
Thomson, John Scott	,, 21st, 1912	,, ,,
Till, William Compton, M.Sc.	November 7th, 1912	December 5th.
Tsao, Hui Chun, B.Sc.	June 6th, 1912	,, ,,
Ure, Paul Jenner	November 7th, 1912	,, ,,
Waldron, Cecil Hamersley	December 7th, 1911	February 15th.
Walker, George	March 21st, 1912	May 2nd.
Wallace, Arthur, B.A., B.Sc.	February 1st, 1912	,, ,,
Waters, Percy Wharton	May 2nd, 1912	June 20th.
Whittick, Frederick George	April 18th, 1912	May 2nd.
Wilkins, Charles Reginald, B.Sc.	March 21st, 1912	,, ,,
Williams, George Mason	April 18th, 1912	June 20th.
Wilson, Forsyth James, D.Sc., Ph.D.	January 18th, 1912	February 15th.
Withers, John Charles, Ph.D.	December 7th, 1911	,, ,,
Wood, John Kerfoot, D.Sc.	,, 21st, 1911	,, ,,

LIST OF HONORARY AND FOREIGN MEMBERS ELECTED DURING 1912.

Prof. Phillippe A. Guye	February 15th, 1912	March 7th.
Dr. Thomas Burr Osborne	,, ,, ,,	,, ,,
Prof. Paul Walden	,, ,, ,,	,, ,,
Prof. Dr. Richard Willstätter	,, ,, ,,	,, ,,

LIST OF FELLOWS DECEASED DURING 1912.

Name.	Elected.	Died.
*Attwood, George	February 18th, 1872	February 9th, 1912.
Beanes, Alfred Edward	December 4th, 1902	March 8th, 1912.
Black, Andrew Heggie	April 17th, 1879	April 22nd, 1912.
Bosanquet, Robert Holford Macdowall	February 2nd, 1865	August 7th, 1912.
Cameron, John Macdonald	June 17th, 1875	September 3rd, 1912.
Coupe, Miles	May 4th, 1905	November 13th, 1912.
* [1] Divers, Edward	February 2nd, 1860	April 8th, 1912.
Ekins, Arthur Edward	December 20th, 1883	March 12th, 1912.
Elkington, Algernon John	May 4th, 1911	February 5th, 1912.
Ferrier, John Oliver	February 19th, 1902	June 17th, 1912.
Fraser, Angus	March 21st, 1867	April 2nd, 1912.
Griffiths, Thomas	April 17th, 1879	February 26th, 1912.
Hill, Alexander	March 16th, 1882	April, 24th, 1912.
Howell, Reginald	February 19th, 1880	August 3rd, 1912.
Johnson, Otis Coe	March 4th, 1897	June 6th, 1912.
*Jones, Humphrey Owen	December 6th, 1900	August 15th, 1912.
Kemp, David Skinner	April 4th, 1867	October 27th, 1912.
*Laycock, William Frederick	April 17th, 1890	September 25th, 1912.
Lichtenstein, Theodore David	February 21st, 1878	October 23rd, 1912.
Low, Charles William	December 18th, 1884	August 9th, 1911.
McArthur, John	December 1st, 1887	December 19th, 1912.
Masters, William	December 4th, 1873	September 29th, 1912.
*Mosenthal, Henry de	April 17th, 1890	December 18th, 1912.
Newlands, Benjamin Edward Reina	February 18th, 1864	August 7th, 1912.
* [2] Pattinson, John	December 3rd, 1863	March 28th, 1912.
Rao, B. Venkata	December 7th, 1911	1912.
*Richardson, Arthur	June 18th, 1883	June 1st, 1912.
Salt, Henry	April 16th, 1863	November 4th, 1912.
Seward, Henry	January 20th, 1870	April 12th. 1912.
tarling, William Robert Rigg	December 6th, 1906	September 25th, 1912.
Strangman, James Pim	February 3rd, 1887	April 23rd, 1912.
* [3] Wade, John	February 6th, 1890	August 15th 1912.
*Wootton, William Ord	December 3rd, 1908	October 17th, 1912.

LIST OF HONORARY AND FOREIGN MEMBERS DECEASED DURING 1912.

Boisbaudran, Lecoq de	February 2nd, 1888	May 28th, 1912.
Mallet, John William	March 2nd, 1911	November 9th, 1912.

* Contributed to the Transactions.

[1] Ordinary Member of Council, 1873–4 ; Vice-President, 1900–03.

[2] Vice-President, 1891–4.

[3] Ordinary Member of Council, 1905–09.

TITLES OF PAPERS COMMUNICATED TO THE SOCIETY DURING 1912.

	Page in Proceedings.	Page in Transactions.
January 18th.		
1. The photophosphorescence of inorganic solid solutions. By A. Lionel Landau	2	—
2. The preparation of conductivity water. By Ferdinand Bernard Thole	3	207
3. The boiling points of mercury, cadmium, zinc, potassium, and sodium. By Charles Thomas Heycock and Francis Edward Everard Lamplough	3	—
4. The formation and reactions of imino-compounds. Part XVII. The alkylation of imino-compounds. By Jocelyn Field Thorpe	4	249
5. 1 : 2-Diketohydrindene. By William Henry Perkin, jun., Walter Morrell Roberts, and Robert Robinson	4	232
6. *iso*Narcotine. By Ernest Griffiths Jones, William Henry Perkin, jun., and Robert Robinson	4	257
7. Esterification constants of some substituted acetic and benzoic acids. By John Joseph Sudborough and Margaret Kathleen Turner	5	237
8. Aromatic antimony compounds. Part III. Primary aryl derivatives. By Percy May	5	1033
9. The aryl ethers of glycide, glycerol, and glycerol-α-monochlorohydrin. By Ernest Robert Marle	5	305
10. The action of ammonia on 6-chloro-2-phenyl 1 : 3-benzoxazine-4-one. By Ernest Chislett Hughes and Arthur Walsh Titherley	6	219
11. The thio-analogues of coumarin and its derivatives. By Arthur Clayton and William Godden	6	210
12. Experiments on the synthesis of brazilin and hæmatoxylin and their derivatives. (Preliminary note.) By William Henry Perkin, jun., and Robert Robinson	7	—
13. The influence of solvents on the rotation of optically active compounds. Part XVII. The relationship between the chemical constitution and the influence of a solvent. By Thomas Stewart Patterson and Elizabeth Findlay Stevenson	8	241
February 1st.		
14. The constituents of commercial chrysarobin. By Frank Tutin and Hubert William Bentley Clewer	13	290
15. The existence of molecular compounds in solution. Part I. By Harold Langton and Albert Ernest Dunstan	14	418

	Page in Proceedings.	Page in Transactions.
16. Researches on bleaching powder. Part II. The action of dilute acids on bleaching powder. By Robert Llewellyn Taylor and Clifford Bostock	14	444
17. The quantitative estimation of hydroxy-, amino-, and imino-derivatives of organic compounds by means of the Grignard reagent, and the nature of the changes taking place in solution. By Harold Hibbert	15	328
18. An exact investigation of the three component system: sodium oxide, acetic anhydride, water. By Alfred Charles Dunningham	16	431
19. β-Gnoscopine. (Preliminary note.) By Edward Hope and Robert Robinson	16	—
20. Anhydrohydrastininemeconine. (Preliminary note.) By Edward Hope and Robert Robinson	17	—
21. The preparation and properties of sulphonic esters. By John Ferns and Arthur Lapworth	18	273
22. Menthyl nitrilotriacetate. By Percy Faraday Frankland and Hugh Henry O'Sullivan	19	287
23. The viscosity of aqueous solutions of sodium palmitate and the influence of electrolytes on the same. By Frederick Denny Farrow	19	347
24. Aromatic amino-derivatives containing antimony. (Preliminary note.) By Gilbert T. Morgan and Frances M. G. Micklethwait	19	—
February 15th.		
25. Perhalides of diphenyliodinium iodide. By Martin Onslow Forster and Johannes Heinrich Schaeppi	37	382
26. The constitution and synthesis of damascenine, the alkaloid of *Nigella damascene*. By Arthur James Ewins	38	544
27. The action of ozone on cellulose. By Mary Cunningham and Charles Dorée	38	497
28. Hydroxymethylphosphinic acid and some homologues. By Harold James Page	38	423
29. Chemical examination of scammony root and of scammony. By Frederick Belding Power and Harold Rogerson	39	398
30. Experiments on the Walden inversion. Part VIII. α-Amino-α-phenylpropionic acids. By Alex. McKenzie and George William Clough	40	390
31. Preparation of the nitrites of the primary, secondary, and tertiary amines. Part I. By Pañchānan Neogi	41	—
32. Nitrites of the mercurialkyl- and mercurialkylaryl-ammonium series. By Prafulla Chandra Rây, Jitendra Nath Rakshit, and Rasik Lal Datta	41	616
33. Nitrites of the alkylammonium series. Part IV. *iso*Butyl-, diethyl-, dipropyl-, and tripropyl-ammonium nitrites. By Prafulla Chandra Rây and Jitendra Nath Rakshit	41	612

	Page in Proceedings.	Page in Transactions.
34. The hydrolysis and saponification of esters of saturated and unsaturated acids. By Thomas Williams and John Joseph Sudborough ...	41	412
35. Investigations on the dependence of rotatory power on chemical constitution. (Preliminary note.) By Robert Howson Pickard and Joseph Kenyon	42	—
36. The methyl, ethyl, and *iso*butyl esters of di-trichloro-acetyltartaric acid, and the existence of minima in their temperature-rotation curves. By Thomas Stewart Patterson and Alfred Davidson	43	374
March 7th.		
37. Isomeric change of halogen-substituted diacylanilides into acylaminoketones. By Andrea Angel	46	515
38. Studies in the camphane series. Part XXXII. Stereo-isomeric modifications of *iso*nitroso-epicamphor, the third and fourth monoximes of camphorquinone. By Martin Onslow Forster and Hans Spiuner	46	1340
39. The synthesis of glyoxaline derivatives allied to pilocarpine. By Frank Lee Pyman	47	530
40. Calcium nitrate. Part I. The two-component system, calcium nitrate, water. Part II. The three-component system, calcium nitrate, nitric acid, water at 25°. By Henry Bassett, jun., and Hugh Stott Taylor	48	576
41. The chemistry of the glutaconic acids. Part III. Glutaconic acid and its β-alkyl derivatives. By Norman Bland and Jocelyn Field Thorpe	49	856
42. Asymmetric quinquevalent nitrogen compounds of simple molecular constitution. By William Jackson Pope and John Read	49	519
43. The interaction of phosphorus and potassium hydroxide solution. By Manindra Nath Banerjee	50	—
44. The triazo-group. Part XX. Azoimides of the propane series. By Martin Onslow Forster and John Charles Withers	50	489
45. Viscosity and association. Part II. The viscosity of geometrical isomerides. By Ferdinand Bernard Thole	51	552
46. The chemistry of the glutaconic acids. A correction. By Jocelyn Field Thorpe	51	—
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PROCEEDINGS

OF THE

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Vol. 28. **No. 395.**

Thursday, January 18th, 1912, at 8.30 p.m., Professor PERCY F. FRANKLAND, LL.D., F.R.S., President, in the Chair.

Messrs. Rufus Gaunt and Harold King were formally admitted Fellows of the Society.

Certificates were read for the first time in favour of Messrs.:

Clement William Bailey, M.Sc., Evington, Leicester.
James Ewart Bridge, B.Sc., Sarnia, Hatfield Road, Ipswich.
William Thomas Clarke, B.Sc., Mansfield Road, Heanor, Derbyshire.
Surendranath De, 21, Srigopal Mullick Lane, Calcutta, India.
Wilfrid James Fleet, Imatra, King's Road, Bournemouth.
Isidor Morris Heilbron, Ph.D., 7, Claremont Terrace, Glasgow.
Charles James, New Hampshire College, Durham, N.H., U.S.A.
James William McMyn, 35, Snowdon Road, Eccles, Manchester.
Pestanji Manekji Modi, B.A., Meher Buildings, Tardeo, Bombay, India.
Richard Gillies Neilson, Burma Oil Co., Ltd., Rangoon, Burma.
John Wilfrid Parkes, 14, Gower Terrace, Willenhall, Coventry.
Edgar Alexander Rayner, B.Sc., 71, Welldon Crescent, Harrow.

Henry Edgar Smith, M.Sc., The Mount, Dawley, Salop.
Percy Rudolph Strivens, The Crofts, Horbury, Wakefield.
Forsyth James Wilson, D.Sc., Ph.D., 96, Great George Street, Glasgow.

The PRESIDENT announced that the Moissan Memorial Lecture would be delivered by Sir William Ramsay, K.C.B., LL.D., F.R.S., on February 29th, 1912, at 8.30 p.m.

Of the following papers, those marked * were read:

***1. "The photophosphorescence of inorganic solid solutions." By A. Lionel Landau.**

A study of the literature of phosphorescent inorganic solid substances leads one to the belief that in cathodophosphorescence the phosphorogen is in solid solution, the particular kind of solid solution being colloidal; this theory explains the variation of the colour of the luminescence that a given phosphorogen imparts to different solvents, and also explains the variation of the colour of the luminescence of a given substance at different temperatures.

Cathodophosphorescent substances are not necessarily photothermoluminescent substances, and the theory was propounded that the latter property is due to the presence of colloidal highly positive element in solid solution in addition to colloidal phosphorogen.

The work already published on fluor-spar and zinc sulphide confirms this theory, and it was shown on experimental grounds that it is quite possible that the particular varieties of the alkaline earth sulphides known as "phosphorescent" also contain colloidal positive element. Evidence was adduced against any other theory so far propounded.

It was further suggested on experimental grounds that the flux necessary in alkaline-earth sulphides acts by rendering the sulphide translucent, and the conclusion was drawn that photothermoluminescence can only be exhibited by substances which are translucent or transparent and contain colloidal phosphorogen and colloidal highly-positive element in solid solution.

DISCUSSION.

In reply to the President, Mr. LANDAU said that the authority for the statement that calcium is produced by the reaction between lime and carbon was Moissan (*Ann. Chim. Phys.*, 1899, [vii], **18**, 289). Calcium carbide was produced when the carbon was in excess; it was not, so far as he knew, phosphorescent.

***2. "The preparation of conductivity water." By Ferdinand Bernard Thole.**

The two best known forms of apparatus for the preparation of conductivity water, namely, those designed by Bousfield and by Hartley, Campbell, and Poole, both suffer from two disadvantages, namely, (1) the condenser is somewhat complex and expensive, and (2) as the water is completely cooled before collection the removal of the carbon dioxide and ammonia from the apparatus is slow.

The author described two inexpensive forms of apparatus (one of which may be readily constructed from ordinary laboratory materials), a common feature of which is that steam may be blown through the collected water, thus rapidly removing dissolved gases. The water obtained has an average conductivity of 1·3—1·2 gemmhos (25°), and therefore compares favourably with that obtained under similar conditions by Bousfield's apparatus.

DISCUSSION.

Dr. DUNSTAN pointed out that he had used Mr. Thole's apparatus during the past two years, and had found it most efficient, not only for the purpose it was immediately designed to fulfil, but also for providing a copious supply of pure dust-free water for physico-chemical experiments.

Mr. THOLE agreed with the President that part of the conductivity of the water obtained was due to dissolution of alkali from the glass condenser and receiving flask, especially as those surfaces were exposed for a short time to the action of boiling water.

The object in view, however, was to design a simple and inexpensive apparatus which would yield water sufficiently pure for most ordinary work. Further purification could only be attained by increasing the cost and complexity of the apparatus.

3. "The boiling points of mercury, cadmium, zinc, potassium, and sodium." By Charles Thomas Heycock and Francis Edward Everard Lamplough.

During the course of some work now in progress, the authors had occasion to determine the boiling points of mercury, cadmium, zinc, potassium, and sodium at different pressures. Below are given the values for the boiling points under a pressure of 760 mm. The temperatures were in all cases determined by means of platinum resistance pyrometers. The temperatures assumed in calibrating

the pyrometers were ice, steam, and the boiling point of sulphur, 444·53° (Callendar and Griffiths):

	Boiling point.	Change in b. p. per mm. at 760.
Mercury	356·7°	0·0746°
Cadmium	765·9	0·12
Zinc	905·7	0·133
Potassium	762·2	0·135
Sodium	882·9	0 153

4. "The formation and reactions of imino-compounds. Par XVII. The alkylation of imino-compounds." By Jocelyn Field Thorpe.

Evidence was recorded in support of the following generalisations:

(1) Compounds containing the complex $CX_2{:}CR{\cdot}CH_2X$, in which X may be any negative group and R any univalent radicle or group, react with sodium ethoxide so as to retain the mobile hydrogen atom, and therefore yield sodium derivatives of the type

$$CX_2{:}CR{\cdot}C\overset{*}{H}NaX,$$

in which the mobile hydrogen is represented by an asterisk. The displacement of the sodium in this compound by an alkyl group yields an alkyl derivative, $CX_2{:}CR{\cdot}CH(Alk)X$, and the action of sodium ethoxide on this substance causes the displacement of the mobile hydrogen atom, but the metal then takes up the most negative position in the system, yielding the sodium derivative, $CNaX_2{\cdot}CR{:}C(Alk)X$.

(2) The imino-compounds react with sodium ethoxide in their amino-form only. They are then derivatives of glutaconic ester, and as such conform to the above generalisation.

5. "1 : 2-Diketohydrindene." By William Henry Perkin, jun., Walter Morrell Roberts, and Robert Robinson.

The authors showed that 1 : 2-diketohydrindene, $C_6H_4\langle\begin{matrix}CO\\CH_2\end{matrix}\rangle CO$, may be prepared from *iso*nitroso-α-hydrindone by treatment with hydrochloric acid in the presence of formaldehyde, and the properties of this substance and those of several of its derivatives were described.

6. "*iso*Narcotine." By Ernest Griffiths Jones, William Henry Perkin, jun., and Robert Robinson.

In order to obtain further evidence in support of the formula suggested for this alkaloid by Perkin and Robinson (*Trans.*, 1911,

99, 777), the authors described some experiments on the condensation of phthaldehydic acid and opianic acid with resorcinol dimethyl ether and catechol dimethyl ether in the presence of hydrochloric acid.

7. "Esterification constants of some substituted acetic and benzoic acids." By John Joseph Sudborough and Margaret Kathleen Turner.

The esterification constants of a number of substituted acetic and benzoic acids have been determined at 15° and 20°, using hydrogen chloride as catalyst.

The relative retarding effects of different substituents are not necessarily the same in the two series.

Acetophenone-*o*-carboxylic and *o*-phenoxybenzoic acids are esterified more readily than benzoic acid.

Hydrogen fluoride is a feeble catalyst as compared with hydrogen chloride.

8. "Aromatic antimony compounds. Part III. Primary aryl derivatives." By Percy May.

Phenylstibinic acid, $C_6H_5 \cdot SbO(OH)_2$, was prepared according to Hasenbäumer's method (*Ber.*, 1898, **31**, 2910), but the product was contaminated with diphenylstibinic acid, $(C_6H_5)_2SbO \cdot OH$. A modification of the method led to the production of pure phenylstibinic acid. The mixture of phenylstibinic and diphenylstibinic acids on nitration yields a mixture of nitro-compounds, from which, by recrystallisation from glacial acetic acid, di-*m*-nitrodiphenylstibinic acid was obtained in yellow needles melting at 210—213° (compare Morgan and Micklethwait, *Trans.*, 1911, **99**, 2294). Reduction of *m*-nitrophenylstibinic acid yielded a small quantity of m-*antimonylaniline*, $NH_2 \cdot C_6H_4 \cdot SbO$, a light, yellow powder, insoluble in water and alkali, soluble in hydrochloric acid. This compound has a powerful irritant action on the mucous membrane. m-*Aminophenylstibinic acid*, $NH_2 \cdot C_6H_4 \cdot SbO(OH)_2$, is produced by the gentle oxidation of this substance, and a very small quantity was isolated in the form of its *chloride*. The *sodium* salt was also obtained, but not in a pure condition.

9. "The aryl ethers of glycide, glycerol, and glycerol-α-monochlorohydrin." By Ernest Robert Marle.

The action between epichlorohydrin and the sodium derivative of a phenol was reviewed, and the methods of preparation described

by Lindeman (*Ber.*, 1891, **24**, 2145), Boyd (*Trans.*, 1901, **79**, 1221), and Boyd and Marle (*Trans.*, 1908, **93**, 838) for glycide ethers and diaryl glycerol ethers, and that described by Boyd and Marle (*Trans.*, 1910, **97**, 1788) for the aryl ethers of glycerol-α-monochlorohydrin have been used to prepare a number of these derivatives so as to complete the series, as far as possible, in the case of some of the more important phenols. The phenylurethanes of the aryl ethers of glycerol-α-monochlorohydrin were also described.

Several new monoaryl ethers of glycerol have been prepared by the action of the sodium derivative of a phenol on glycerol-α-monochlorohydrin.

Evidence was adduced to show that the action of concentrated hydrochloric acid on a glycide ether is to produce γ-chloro-β-hydroxy-α-aryloxypropane, the isomeric β-chloro-γ-hydroxy-α-aryloxypropane being formed, if at all, only in very small amount.

10. "The action of ammonia on 6-chloro-2-phenyl-1 : 3-benzoxazine-4-one." By Ernest Chislett Hughes and Arthur Walsh Titherley.

Similar observations have been made as to the action of ammonia on 6-chloro-2-phenyl-1 : 3-benzoxazine-4-one, $C_6H_3Cl\begin{<}{CO\cdot N}{O—C\,Ph}$, to those in the case of the parent ring compound devoid of chlorine.

A bright yellow, crystalline compound, *5-chlorosalicylbenzamidine*, $OH\cdot C_6H_3Cl\cdot CO\cdot N{:}CPh\cdot NH_2$, results through rearrangement of the intermediate additive ring-compound formed. By long-continued action of ammonia, *5′-chloro-2′-hydroxy-2 : 4 : 6-triphenyl-1 : 3 : 5-triazine*, $OH\cdot C_6H_3Cl\cdot C$, is obtained as a pale yellow solid, and the same compound is produced with great rapidity by the action of benzamidine on 6-chloro-2-phenyl-1 : 3-benzoxazine-4-one. It is also produced more slowly from benzamidine and phenyl 5-chlorosalicylate or 5-chlorosalicylbenzamidine.

11. "The thio-analogues of coumarin and its derivatives." By Arthur Clayton and William Godden.

Certain nitrothiocoumarins were prepared by heating the corresponding nitrocoumarins with xylene and phosphorus pentasulphide, and their identities established by partial oxidation, which in each case yielded the parent nitrocoumarin. The ketonic structure

present in the thiocoumarins was shown to be preserved in their nitro-derivatives, as the latter compounds yield oximes and hydrazones. The nitrothiocoumarins possess a deep golden colour, thus differing from the nitrocoumarins, which are white; the yellow colour, heretofore stated to characterise 8-nitrocoumarin, was shown to be due to the presence of an impurity.

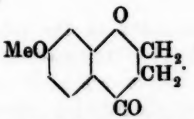
12. "Experiments on the synthesis of brazilin and hæmatoxylin and their derivatives." (Preliminary note.) By William Henry Perkin, jun., and Robert Robinson.

The publication by Tschitschibabin and Nikitin (*J. Russ. Phys. Chem. Soc.*, 1911, **43**, 1185) of a note on 3-methoxydihydro-1:4-benzopyrone leads the authors to submit the results of a research on the same subject, on which they have been engaged at intervals during the last two years.

m-*Methoxy-β-phenoxypropionic acid*,

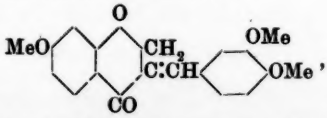
$$MeO\cdot C_6H_4\cdot O\cdot CH_2\cdot CH_2\cdot CO_2H,$$

was obtained by the interaction of resorcinol monomethyl ether and β-iodopropionic acid in aqueous alkaline solution, and also by the hydrolysis of the ester resulting from the condensation of sodioresorcinol monomethyl ether and ethyl β-iodopropionate. It crystallises from water in shining leaflets melting at 82°, and dissolves in nitric acid to an intense green solution, which becomes bluish-green after dilution with water. On treatment with phosphoric oxide in benzene solution, under the same conditions as were used for the preparation of dimethoxyhydrindone (*Trans.*, 1907, **91**, 1080), this acid is easily converted into 7-*methoxy*-2:3-*dihydro*-1:4-*benzopyrone* (7-*methoxychromanone*),



The ketone is best purified by distillation, and boils at 197°/30 mm. It crystallises from light petroleum in colourless needles melting at 56°. The *semicarbazone* crystallises from alcohol in small, glistening plates, melting and decomposing at 222°.

Veratrylidene-7-methoxychromanone,

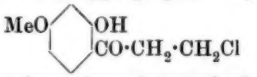


is closely related to trimethylbrazilin, and is obtained by treatment

of equimolecular quantities of methoxychromanone and veratraldehyde in methyl alcohol with potassium hydroxide. It consists of almost colourless needles, and can be easily crystallised from ethyl or methyl alcohols. It is rather sparingly soluble, melts at 140°, and dissolves in sulphuric acid to an intense crimson solution. Indications have already been obtained that it is possible to convert this substance into a derivative of brazilin.

The poor yield obtained in the preparation of methoxyphenoxypropionic acid led the authors to investigate other methods of preparation of methoxychromanone, but up to the present time they are unable to dispense with that described above.

ω-Chloro-2-hydroxy-4-methoxypropiophenone,



is produced by the condensation of resorcinol dimethyl ether and β-chloropropionyl chloride in light petroleum solution in the presence of anhydrous aluminium chloride. It crystallises from methyl alcohol in groups of colourless needles. On heating, it softens at 98°, and undergoes no further change until the almost liquid substance becomes transparent at 138°. Decomposition also occurs at this temperature. It gives a violet coloration with ferric chloride, and has the irritating properties of chloro-ketones. On treatment with alkalis the production of methoxychromanone was expected, but instead a substance is quantitatively produced, which crystallises from ethyl acetate in colourless needles melting at 249—250°. The nature of this compound has not yet been completely elucidated.

13. "The influence of solvents on the rotation of optically active compounds. Part XVII. The relationship between the chemical constitution and the influence of a solvent." By Thomas Stewart Patterson and Elizabeth Findlay Stevenson.

The influence of a number of solvents in modifying the rotation of an optically active ester was described and discussed in connexion with the chemical constitution of the solvent.

ADDITIONS TO THE LIBRARY.

I. *Donations.*

Aberdeen, University of. Subject catalogue of the Phillips Library of Pharmacology and Therapeutics. Aberdeen 1911. pp. 240. 2*s.* 6*d.* (*Recd.* 29/12/11.) From the University.

Bristol and Clifton Hotwells. A few words on the Bristol and Clifton Hotwells. Together with an analysis of the Spa by William Herapath. Bristol [1854]. pp. 24. From Dr. A. Scott, F.R.S.

Herapath, *William.* See **Bristol and Clifton Hotwells.**

Hoppe-Seyler, *Ernst Felix Immanuel* [Editor]. Medicinisch-chemische Untersuchungen. Aus dem Laboratorium für angewandte Chemie zu Tübingen. Berlin 1866–1871. (*Reference.*) From Dr. R. H. Aders Plimmer.

Institute of Brewing. Collective index of the Journal, [*&c.*] 1887 to 1910. Compiled by *William H.* **Bird.** London 1911. pp. iv + 550. 10*s.* 6*d.* (*Reference.*) From the Institute.

Maurantonio, *Leonardo.* L'arsenico nella scienza, nell' industria e negli avvelenamenti. Milano 1912. pp. xii + 256. ill. L2.50. (*Recd.* 1/1/12.) From the Publisher: Ulrico Hoepli.

Saint Andrews, University of. *Five hundredth Anniversary.* Memorial volume of scientific papers contributed by Members of the University. Edited by *William Carmichael* **M'Intosh,** *John Edward Aloysius* **Steggall,** and *James Colquhoun* **Irvine.** Edinburgh 1911. pp. xi + 354. 10*s.* 6*d.* (*Recd.* 21/12/11.) From the University.

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II. *By Purchase.*

Abderhalden, *Emil* [Editor]. Biochemisches Handlexikon. Vols. I to VII. i. Berlin 1911. M. 324.—. (*Reference.*)

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III. *Pamphlets.*

Benjamin, *Marcus.* American art pottery. (From the *Glass and Pottery World*, 1907.)

Bruce, *W.* Report on cattle-feeding experiments with soya-bean cake. (*Edinburgh and East of Scotland Coll. of Agric., Report*, 25. 1911.)

Chacón, *Aníbal.* La molécule cyclique. Une nouvelle hypothèse sur le benzène allotropie et polymérie. Montevideo 1911. pp. 43.

Egypt, *Survey Department.* A report on the work of the Laboratories in 1910. By A. Lucas. Cairo 1911. pp. 21.

Lucas, *Alfred.* Preservative materials used by the ancient Egyptians in embalming. Cairo 1911. pp. 59.

Seubert, *Karl.* Gedächtnisfeier bei der Enthüllung des Marmorbildnisses von Professor Dr. Lothar Meyer im grossen Hörsaal des neuen chemischen Universitäts Laboratoriums zu Tubingen am 3 August, 1911. Tubingen 1911. pp. 22.

ERRATA.

PROCEEDINGS, 1906.

P. 105, line 6 from top *for* "thiocarbimide" *read* "thiocarbamide."
P. 111, „ 8 „ „ „ "3 : 5-dibromo-4-acetonylbenzoic" *read* "3 : 5-dibromo-4-acetoxybenzoic.

At the next Ordinary Scientific Meeting on February 1st, 1912, at 8.30 p.m., the following papers will be communicated:

"The constituents of commercial chrysarobin." By F. Tutin and H. W. B. Clewer.

"Researches on bleaching powder. Part II. The action of dilute acids on bleaching powder." By R. L. Taylor and C. Bostock.

"The quantitative estimation of hydroxy-, amino-, and imino-derivatives of organic compounds by means of the Grignard reagent, and the nature of the changes taking place in solution." By H. Hibbert.

"An exact investigation of the three-component system—sodium oxide, acetic anhydride, water." By A. C. Dunningham.

R. CLAY AND SONS, LTD., BRUNSWICK ST., STAMFORD ST., S.E., AND BUNGAY, SUFFOLK.

[*Issued* 12/2/12

PROCEEDINGS

OF THE

CHEMICAL SOCIETY.

Vol. 28. No. 396.

Thursday, February 1st, 1912, at 8.30 p.m., Mr. C. E. Groves, F.R.S., in the Chair.

Certificates were read for the first time in favour of Messrs.

Robert Percy Douglas, Prudential Buildings, Bolton.

Elliott Alfred Evans, College of Agriculture, Holmes Chapel.

Edward Percy Frankland, B.A., Ph.D., M.Sc., The Dell, Northfield, Birmingham.

Walter Elmslie Hawkins, B.Sc., 86, Park Lane, Croydon.

Harold John de Quetteville Lenfestey, 50, Tettenhall Road, Wolverhampton.

Ambat Kesava Menon, B.A., 45, York Grove, Peckham, S.E.

George Macaulay Painter, B.Sc., Rosemeade, Thundersley, Essex.

Henry Alfred Shute, B.Sc., 102, Meeting House Lane, Peckham, S.E.

Arthur Wallace, B.A., B.Sc., 1, St. Lawrence Road, Clontarf, Dublin.

Of the following papers, those marked * were read:

***14. "The constituents of commercial chrysarobin."**
By Frank Tutin and Hubert William Bentley Clewer.

Three samples of commercial chrysarobin and one of Araroba powder have been very fully examined. Chrysarobin was found to

vary considerably in the relative proportions of its constituents, but what may be considered a typical sample had the following approximate composition: Chrysophanic acid (5 per cent.); emodin monomethyl ether (2 per cent.); the anthranol of chrysophanic acid, which was described by Jowett and Potter (*Trans.*, 1902, **81**, 1575) under the name of "chrysarobin" (46 per cent.); the anthranol of emodin monomethyl ether (a small amount); *monomethyl ether* of *dehydroemodinanthranol*, $C_{16}H_{12}O_4$ (18 per cent.); *ararobinol*, $C_{23}H_{16}O_5$ (4 per cent.); and an inseparable mixture of substances, together with amorphous material (about 25 per cent.). One specimen of chrysarobin was devoid of ararobinol, whilst another contained a little emodin.

The Araroba powder, in addition to the above-mentioned constituents of the chrysarobin, contained an appreciable amount of emodin, a small amount of a sugar which yielded *d*-phenylglucosazone, and traces of the higher fatty acids and a substance which appeared to be a hydrocarbon.

The "dichrysarobin" and "dichrysarobin methyl ether" described by Jowett and Potter (*loc. cit.*) have been shown to be mixtures of the anthranols of chrysophanic acid and of emodin, and the anthranol of chrysophanic acid and the monomethyl ether of dehydroemodinanthranol respectively.

***15. "The existence of molecular compounds in solution. Part I." By Harold Langton and Albert Ernest Dunstan.**

In an endeavour to show that double salts such as astrakanite have a continued existence in solution, the authors have investigated the viscosity-concentration and viscosity-temperature curves for various solutions containing the mixed sodium and magnesium sulphates and astrakanite itself.

They find that perfectly smooth curves can be constructed, and no change in curvature obtains on passing through the transition point.

Incidentally, the authors have worked out a simple method for the determination of transition points.

16. "Researches on bleaching powder. Part II. The action of dilute acids on bleaching powder." By Robert Llewellyn Taylor and Clifford Bostock.

The authors have used Taylor's method of determining the proportion of hypochlorous acid and chlorine in a mixture of the two for investigating the action of (*a*) sulphuric, hydrochloric, and

nitric acids; (*b*) acetic and phosphoric acids; (*c*) boric and carbonic acids, on a mixture of bleaching powder and water.

When bleaching powder mixed with thirty times its weight of water is distilled with one of the three first acids, in quantity slightly greater than is required to neutralise the free lime, hypochlorous acid with a small amount of chlorine is evolved. When the acid is sufficient to decompose the whole of the hypochlorite present as well, the proportion of chlorine is greater. With larger quantities of acid the amount of hypochlorous acid rapidly diminishes until nothing but chlorine is evolved. There is not much difference in the action of the three acids.

Acetic and phosphoric acids behave much in the same way, using small quantities of acid, but even with comparatively large amounts of acid the proportion of hypochlorous acid does not fall much below 50 per cent.

When bleaching powder is distilled with once or twice its weight of boric acid and a sufficient amount of water, almost pure hypochlorous acid is obtained, and there is not much difference in the result if the boric acid used is as much as three times the weight of the bleaching powder.

When carbon dioxide is bubbled through a mixture of bleaching powder and water at different temperatures, whilst at the ordinary temperature nothing but chlorine is evolved, as soon as the liquid becomes warm some hypochlorous acid is given off. As the temperature rises the proportion of hypochlorous acid increases, until, when the liquid is actively boiling, the distillate is a practically pure solution of hypochlorous acid, hardly any chlorine being evolved.

17. **"The quantitative estimation of hydroxy-, amino-, and imino-derivatives of organic compounds by means of the Grignard reagent, and the nature of the changes taking place in solution." By Harold Hibbert.**

The author finds that the lower fatty alcohols when treated with magnesium methyl iodide in phenetole or amyl ether solution react quite abnormally, the amount of methane evolved falling much below that demanded by theory; thus with methyl, ethyl, and propyl alcohols the methane evolved amounts to only 43, 71, and 83 per cent. respectively. The lower fatty amines also behave abnormally in these solvents, in certain cases no evolution of gas whatever taking place at the ordinary temperature when such derivatives are mixed with the Grignard reagent. Experiments carried out in phenetole solution with fatty and aromatic hydroxy-, amino-, and imino-derivatives always gave too low values. The

cause of this would seem to be (at least, in the case of the lower fatty alcohols) in the formation of two isomeric compounds, namely, (*a*) $\begin{matrix}R\\H\end{matrix}\!>\!O\!<\!\begin{matrix}MgI\\CH_3\end{matrix}$ and (*b*) $\begin{matrix}R\\H\end{matrix}\!>\!O\!<\!\begin{matrix}Mg\cdot CH_3\\I\end{matrix}$, one of which, (*a*), is stable, the other, (*b*), unstable, decomposing at the ordinary temperature into methane and RO·MgI. Evidence was given indicating that on mixing one of the lower alcohols with magnesium methyl iodide in phenetole solution, an equilibrium mixture of the above two isomeric forms is produced.

The conclusion was drawn that the method originally proposed by Hibbert and Sudborough (*Trans.*, 1904, **85**, 933) for the estimation of hydroxyl groups in organic compounds is not generally applicable; only in the case of the aromatic derivatives and where amyl ether (not phenetole) is employed as the solvent, are the results of value. Pyridine (Zerewitinoff, *Ber.*, 1907, **40**, 2023) appears accordingly to be the most suitable solvent for this purpose, but as no experiments have as yet been carried out by him on the lower fatty alcohols and amines in this solvent, no decisive answer can as yet be given regarding this substance. The use of dimethylaniline was suggested as a possible substitute for pyridine.

18. "An exact investigation of the three component system: sodium oxide, acetic anhydride, water." By Alfred Charles Dunningham.

This system has been investigated fully from the point of view of the phase rule between the temperatures 0° and 75°. The author finds the only phases stable between these temperatures to have the formulæ, $C_2H_3O_2Na$; $C_2H_3O_2Na,3H_2O$; $C_2H_3O_2Na,C_2H_4O_2$; and $C_2H_3O_2Na,2C_2H_4O_2$. No trace of the hemihydrate,

$$C_2H_3O_2Na,\tfrac{1}{2}H_2O,$$

has been found, although this was given by Dukelski (*Zeitsch. anorg. Chem.*, 1909, **62**, 114) as the phase formed at 30° by the dehydration of $C_2H_3O_2Na,3H_2O$ by sodium hydroxide.

19. "β-Gnoscopine." (Preliminary note.) By Edward Hope and Robert Robinson.

The condensation of cotarnine with nitromeconine, resulting in the production of a base, $CH_2{:}O_2{:}C_{18}H_{11}O_2(OMe)_3\cdot NO_2$, has already been briefly described (Hope and Robinson, *Proc.*, 1910, **26**, 228), and the substance so synthesised was termed nitrognoscopine. The amino-derivative, obtained on reduction, has now been converted into the hydrazine, which, on oxidation, yields not gnoscopine, but a stereoisomeride. It is proposed that *r*-narcotine shall be termed α-gnoscopine, whilst the new stereoisomeride is β-gnoscopine.

In consequence, the nitro- and amino-derivatives are nitro-β-gnoscopine and amino-β-gnoscopine respectively.

Hydrazino-β-gnoscopine, $CH_2{:}O_2{:}C_{18}H_{11}O_2(OMe)_3{\cdot}NH{\cdot}NH_2$, is prepared by the reduction of diazotised amino-β-gnoscopine with stannous chloride in concentrated hydrochloric acid solution. It crystallises from ethyl alcohol in prisms melting at 205—206°. Copper acetate oxidises it in cold dilute acetic acid solution, and yields β-gnoscopine, $CH_2{:}O_2{:}C_{18}H_{12}O_2(OMe)_3$.

This substance crystallises in well defined prisms from methyl or ethyl alcohols, or ethyl acetate. It melts at 180°, and the melting point is depressed when the substance is mixed with a small quantity of α-gnoscopine. It forms a sparingly soluble hydrochloride and nitrate, but is in most respects similar to α-gnoscopine and narcotine. On oxidation with dilute nitric acid it yields cotarnine and opianic acid. Its methosulphate is changed on boiling with dilute potassium hydroxide into the potassium salt of narceine, from which pure narceine, identical with the natural product, was isolated.

In view of the large rotation of narcotine and the pronouncedly racemic character of α-gnoscopine, it is provisionally suggested that the α-modification corresponds with racemic acid and the β-form with *i*-tartaric acid. Experiments are in progress having for their object the resolution of β-gnoscopine and also its conversion into α-gnoscopine.

20. "Anhydrohydrastininemeconine." (Preliminary note.)

By Edward Hope and Robert Robinson.

The methods employed for the synthesis of β-gnoscopine (see preceding abstract) have been applied to the synthesis of anhydrohydrastininemeconine, [*dl*(or *r*)-β(or α)-hydrastine]. The various processes give excellent yields so far as the preparation of the hydrazine, and the oxidation of this compound also gives a good yield of crude material, of which only about 50 per cent. is obtained in a pure condition.

Nitro-dl-β(or α)-*hydrastine*, $CH_2{:}O_2{:}C_{18}H_{12}O_2(OMe)_2{\cdot}NO_2$, is produced by boiling an alcoholic solution of hydrastinine with nitromeconine. It crystallises from trichloroethylene in orange-yellow prisms, which melt at 173°, and decompose a few degrees higher. Its salts resemble those of nitro-β-gnoscopine. On boiling with glacial acetic acid, hydrastinine and nitromeconine are regenerated.

Amino-dl-β(or α)-*hydrastine*, $CH_2{:}O_2{:}C_{18}H_{12}O_2(OMe)_2{\cdot}NH_2$, is readily produced by the reduction of the foregoing nitro-compound with tin and stannous chloride in glacial acetic and concentrated hydrochloric acid solution. The substance is best crystallised from

chloroform and methyl alcohol, and occurs in rosette-shaped aggregates of prismatic needles. It melts at 214°, and decomposes at a slightly higher temperature. Characteristic of this substance is the very small solubility of the hydrochloride. The amine is very sparingly soluble in ether, and the solution exhibits an intense bluish-violet fluorescence.

Hydrazino-dl-β(or α)-*hydrastine*, $CH_2{:}O_2{:}C_{18}H_{12}O_2(OMe)_2{\cdot}NH{\cdot}NH_2$, obtained in the usual way, crystallises from ethyl alcohol in colourless, hexagonal prisms, and melts at 174—175°, with evolution of gas at 180°. On oxidation with copper acetate in faintly acid solution it is changed into *anhydrohydrastininemeconine*,

$$CH_2{:}O_2{:}C_{18}H_{13}O_2(OMe)_2.$$

This isomeride of hydrastine crystallises in apparently rectangular prisms from methyl alcohol or ethyl acetate. It melts at 137°, a fact which, combined with the known melting points of narcotine, α- and β-gnoscopines, and hydrastine, would seem to indicate that it is the β- and not the α-form of inactive hydrastine. Since *dl*-α-hydrastine is an unknown substance, it is impossible to state this conclusion with confidence. The methosulphate of the synthesised base yields, on treatment with alkali, methylhydrastine, which crystallises from alcohol in yellow needles melting at 156°, and is identical with methylhydrastine derived from the natural product. These experiments are being continued and extended in various directions, and it is desired to reserve for a short period the investigation of this and similar condensations.

21. "The preparation and properties of sulphonic esters." By John Ferns and Arthur Lapworth.

The properties of certain sulphonic esters, as well as the question of the applicability of the methods available for the direct conversion of alcohols into sulphonic esters, have been carefully studied. These methods fail completely in certain instances, and the explanation has been found in each case.

Esters of aromatic sulphonic acids resemble the corresponding esters of the halogen hydrides, rather than those of carboxylic acids. The general character of a sulphonic ester, and consequently the most suitable method of preparing it, may often be foreseen when the properties of the corresponding halide ester are known.

The reactions of the esters with amines, potassium alkyloxide, the Grignard and other reagents have been examined in detail. The authors confirm Strecker's observation (*Ber.*, 1910, **43**, 1131 *et seq.*) that ethyl ethanesulphonate yields mainly phenyl ethyl sulphone with magnesium phenyl bromide, but they also detected

ethylbenzene as a product; with ethyl toluene-*p*-sulphonate, on the other hand, this reagent yields only ethylbenzene and no detectable quantity of sulphone.

22. "Menthyl nitrilotriacetate."

By Percy Faraday Frankland and Hugh Henry O'Sullivan.

In endeavouring to prepare menthyl aminoacetate by the action of ammonia on menthyl chloroacetate, the authors have obtained the menthyl ester of Heintz' nitrilotriacetic acid (*Annalen*, 1862, **122**, 269), $N(CH_2 \cdot CO_2 \cdot C_{10}H_{19})_3$. It crystallises in prismatic needles melting at 80·5°. The authors have determined the rotatory power in the fused state and in methyl-alcoholic solution. The relation between the rotation of this and some other menthyl compounds was discussed.

23. "The viscosity of aqueous solutions of sodium palmitate and the influence of electrolytes on the same." By Frederick Denny Farrow.

The viscosity has been measured, at 70°, of aqueous solutions of sodium palmitate up to concentrations of 0·5 gram-molecule per 1000 grams of solution. Over this range the values found are (by interpolation on a smooth curve):

Concentration.	Viscosity (in absolute units $\times 10^5$).	Concentration.	Viscosity (in absolute units $\times 10^5$).
0·0 (water)	0·407	0·3	0·882
0·1	0·540	0·4	1·185
0·2	0·699	0·5	1·800

Determinations were also made of the viscosity of solutions of a definite soap-concentration, in which varying amounts of sodium hydroxide, sodium chloride, or potassium chloride were present. It was found that each of these salts lowers the viscosity when present in small quantity (up to $N/20$ in a soap solution of concentration 0·25). The presence of these substances in larger amounts than these causes a rapid increase in the viscosity of the solution. In each of the three cases the effect of the electrolyte is quite similar, and for sodium hydroxide and sodium chloride the effects are practically identical. The bearing of this phenomenon on the colloidal nature of soap solutions was discussed.

24. "Aromatic amino-derivatives containing antimony." (Preliminary note.) By Gilbert T. Morgan and Frances M. G. Micklethwait.

In reference to an abstract on aromatic antimony compounds recently published by P. May (this vol., p. 5), the authors pointed

out that they have for some time been engaged in studying the reduction products of the nitrated aromatic antimony derivatives, the orientation of which was described in a previous communication (*Trans.*, 1911, **99**, 2294).

Indications were obtained of the production from *m*-nitrophenylstibinic acid of the *m*-aminophenylstibine oxide and the *m*-aminophenylstibinic acid referred to by May. Di-*m*-nitrodiphenylstibinic acid on reduction yielded *di*-m-*aminodiphenylhydroxystibine*, $(NH_2 \cdot C_6H_4)_2Sb \cdot OH$:

0·0908 gave 0·1494 CO_2 and 0·0329 H_2O. C = 44·87; H = 4·02.

0·1536 „ 12·0 c.c. N_2 at 17° and 766 mm. N = 9·14.

$C_{12}H_{13}ON_2Sb$ requires C = 44·85; H = 4·04; N = 8·74 per cent.

The base is a colourless, caseous mass, melting indefinitely at 76—80°, precipitated from acid solutions by ammonia, and turning brown on exposure.

The *hydrochloride*, $SbCl(C_6H_4 \cdot NH_2)_2,2HCl$, crystallises from acidified water in very soluble, colourless needles:

0·1849 gave 0·2319 CO_2 and 0·0628 H_2O. C = 34·21; H = 3·77.

0·1538 „ 0·1598 AgCl. Cl = 25·71.

$C_{12}H_{14}N_2Cl_3Sb$ requires C = 34·90; H = 3·39; Cl = 25·81 per cent.

The base and its salts have an irritating action on the mucous membrane of the throat and nose, which is even more intense than that noticed in the case of tri-*m*-aminotriphenylstibine and its hydrochloride (*Trans.*, *loc. cit.*).

MOISSAN MEMORIAL LECTURE.

An Extra Meeting will be held on Thursday, February 29th, 1912, at 8.30 p.m., when the Moissan Memorial Lecture will be delivered by Sir William Ramsay, K.C.B., F.R.S.

VAN'T HOFF MEMORIAL.

Subscriptions to this fund may be sent to the Treasurer of the Society (Dr. Alexander Scott). The amount already received amounts to sixteen pounds, fourteen shillings.

At the next Ordinary Scientific Meeting on Thursday, February **15th**, 1912, at **8 30** p.m., there will be a Ballot for the election of Fellows.

The following papers will be communicated:

"Chemical examination of Scammony root and of Scammony." By F. B. Power and H. Rogerson.

"Experiments on the Walden inversion. Part VIII. α-Amino-α-phenylpropionic acids." By A. McKenzie and G. W. Clough.

"Preparation of the nitrites of the primary, secondary, and tertiary amines by the distillation and sublimation in a vacuum of concentrated solutions of mixtures of the hydrochlorides of the bases and alkali nitrites. Part I." By P. Neogi.

"Nitrites of the mercurialkyl- and mercurialkylaryl-ammonium series." By P. C. Rây, J. N. Rakshit, and R. L. Datta.

"Nitrites of the alkylammonium series. Part IV. *iso*Butyl-, diethyl-, dipropyl-, and tripropyl-ammonium nitrites, and their decomposition and sublimation by heat." By P. C. Rây and J. N. Rakshit.

"Perhalides of diphenyliodonium iodide." By M. O. Forster and J. H. Schaeppi.

CERTIFICATES OF CANDIDATES FOR ELECTION AT THE NEXT BALLOT.

N B.—The names of those who sign from "General Knowledge" are printed in *italics*.

The following Candidates have been proposed for election. A ballot will be held on February 15th, 1912.

Backer, Hilmar Johannes,

4, Upper Bedford Place, London, W.C.

Worker in the Davy-Faraday Laboratory of the Royal Institution. Doctor of Chemistry (Leyden) on a dissertation entitled, "De nitraminen en hunne electrochemische reductie tot hydrazinen, Leyden, 1911." Had a short training in electrochemistry at the Physico-chemical Laboratory of the University of Giessen. Was for five years Assistant at the Organic Chemical Laboratory of the Leyden University.

A. P. N. Franchimont.	T. E. Thorpe.
James Dewar.	William Ramsay.
Hugo Müller.	George Barger.

Bailey, Clement William,

Evington, Leicester.

Student. M.Sc. Birmingham. Priestley Research Scholar.

Percy F. Frankland.	C. K. Tinkler.
Hamilton McCombie.	J. E. Coates.

Percy May.

Barrow, Fred,

Birkbeck College, Breams Buildings, Fetter Lane, E.C.

Lecturer and Demonstrator in Chemistry. M.Sc. (Birm.), Ph.D (Strassburg); 1851 Exhibition Scholar. Publications (with Professor P. F. Frankland): "The Acylbornylamines. I and II." (*Trans.*, 1909); (with Alex. McKenzie) "Experiments on the Walden Inversion. VII." (*Trans.*, 1911).

Percy F. Frankland.	G. W. Clough.
Alex. McKenzie.	A. J. Greenaway.
Hamilton McCombie.	*G T. Morgan.*

Bearder, Ernest Arthur, M.Sc.,

Mayfield, Wythenshawe Road, Sale, Cheshire.

Research Chemist. Student of Chemistry; six years at the University of Leeds, graduating with First Class Honours in Chemistry (Tinctorial), and subsequently taking the degree of M.Sc. Two years post-graduate research in Tinctorial Chemistry. A research on the "Alkaline Condensations of Nitrohydrazo compounds" (*Trans. Chem. Soc.*, Nov., 1911). Awarded Leblanc medal for special distinction in Honours School of Tinctorial Chemistry. Clothworkers' Research Scholar at Leeds. Silver and Bronze Medallist, City and Guilds of London Institute.

A. G. Green. Arthur Smithells.
Henry R. Procter. J. B. Cohen.
H. M. Dawson. W. Lowson.

W. H. Perkin.

Blackstock, Gibbs,

79, Prince Arthur Avenue, Toronto, Canada.

Assistant, Chemical Staff, University of Toronto. One year's experience in research, Organic Chemistry. Honours graduate (B.A.) in Arts (Chemistry and Mineralogy). One year's work as laboratory instructor in Chemistry.

W. R. Lang. W. H. Ellis.
W. Lash Miller. *William Ramsay.*

Arthur W. Crossley.

Bridge, James Ewart,

"Sarnia," Hatfield Road, Ipswich.

Head Teacher, Nacton Road Council School, Ipswich. B.Sc. (Lond.), First Division, including Chemistry. L.C.P. (Licentiate of College of Preceptors). Late teacher of Chemistry, Ipswich Municipal Secondary School. Late student of Chemistry, Portmouth Municipal Technical College.

Wm. C. S. Stanger. H. W. Southgate.
T. Martin Lowry. J. H. A. Hebron.

W. Briggs.

Brownlie, David,

41, Corporation Street, Manchester.

Consulting Technical Chemist. *Education*: four silver medals, one bronze medal, Technological Examinations of the London City and Guilds; 1st Class Honours, Organic and Inorganic Chemistry, South Kensington; B.Sc. (University of London), Honours in Chemistry. *Experience*: five years assistant technical chemist with Messrs. Levinstein, Ltd., colour manufacturers, Crumpsall; three years technical chemist, two years works manager, Messrs. W. C. Thompson,

Manchester, colour manufacturers; three years technical manager and chemist with Messrs. The United Turkey Red Co., Ltd., Dumbartonshire, N.B.; one year works manager, Manchester Dyers, Ltd.; one and a-half years consulting and analytical chemist. *Publications*: "Chemical Action of Light on Dyed Colours," *Soc. Dyers and Colourists*, Dec. 1902; "Some Remarks on the Chemical Action of Light on Dyed Colours," *Soc. Dyers and Colourists*, May, 1910.

Ernest Clark. Jul. Hübner.
B. Prentice. W. H. Bentley.

J. R. Appleyard.

Brunjes, Thomas Alfred,

49, St. Donatts Road, New Cross, London, S.E.

Assistant Chemist. Studied Chemistry for four (4) years at the Blackheath School of Chemistry. Assistant for seven years to Arthur J. Dickinson, F.I.C. Eleven years actively engaged in the manufacture of all tar and ammonia products, distillation of rosin, refining oils, bleaching, batching oil, etc.

F. Napier Sutton. R. M. Harland.
Arthur J. Dickinson. Rudolph Messel.

Henry Bassett.

Bunker, Sidney Waterfield,

30, York Street, Twickenham, Middlesex.

Analytical Chemist. B.Sc. (1st Class Hons.), 1911. Late Student of King's College under Prof. Jackson, F.I.C., F.C.S., and others. Part author, with John C. Umney, F.C.S., of paper on "Asafœtida" (British Pharmaceutical Conference, 1910). During the past four years engaged in analytical and assay work in laboratories of Messrs. Wright, Layman & Umney, Southwark.

John M. Thompson. Henry L. Smith.
Herbert Jackson. John C. Umney.
Patrick H. Kirkaldy. C. T. Bennett.

Clarke, William Thomas,

Mansfield Road, Heanor, Derbyshire.

Schoolmaster. For seventeen years Science Master of the Heanor Secondary School, and Chemistry Master of the Heanor (Evening) Technical School. Bachelor of Science of the University of London.

F. Stanley Kipping. W. W. Tunnicliffe.
R. M. Caven. *R. Lloyd Whiteley.*

T. Campbell James.

Colclough, Tom Peach, M.Sc.,

47, Vicar Lane, Woodhouse, near Sheffield.

Senior Science Master, the Secondary School, Woodhouse, Sheffield. 1902–6: Courses of Study for Master of Science in Chemistry at the Victoria University, Manchester; 1907–9: Teacher of Chemistry at Ashford Grammar School, and Secondary School, Croydon; 1909–, Senior Science Master and Lecturer in Science for Miners at the Woodhouse Secondary School.

Harold B. Dixon.	R. Robinson.
Alfred Holt.	Ch. Weizmann.
W. H. Perkin.	E. C. Edgar.

Curtis, Frederic Fernandez,

20, Bury Street, Bloomsbury, London, W.C.

Pharmacist. Member of the Pharmaceutical Society. Pharmacist. Trained at the School of Pharmacy of the Pharmaceutical Society. Was some time with Messrs. Allen and Hanbury, Lombard Street, E.C. Have had two years' experience in Continental pharmacies, and am desirous of doing more analytical work in London.

Arthur W. Crossley.	Charles Gilling.
Chas. Horne Warner.	H. Arnfield.
C. H. Hampshire.	*J. E. Coates.*

De, Surendranath, L.M.S.

21, Srigopal Mullick Lane, Calcutta, India.

Medical Practitioner. A graduate of the Calcutta Medical College, and an L.M.S. of Calcutta University. A student of Theoretical and Practical Chemistry in 1899 and 1900 in Calcutta Medical College, and passed the Preliminary Scientific M.B. Examination in Chemistry. A student of Theoretical and Practical Chemistry in B.A. Class of the Calcutta St. Xavier's College from 1896 to 1898. A student of Analytical Chemistry in the Indian Association for the Cultivation of Science, Calcutta.

Tarak Nath Majumdar.	Jatindranath Sen.
Haradhan Ray.	*Manindra Sinha.*

Bidhu Bhusan Dutta.

Dick, Thomas Sharp,

15, South Street, Greenock, Scotland.

Analytical Chemist. Analytical Chemist to Messrs. The Brewers Sugar Co., Ltd., Greenock. Five years Assistant and nine years Chief Chemist to the above Company. I desire to keep in touch with the last investigations in Chemistry.

Lawrence Briant.	Angus Smith.
Harold Harman.	*T. L. Patterson.*

Jno. Peden.

Dodson, Harold Forster,

6, Lune Street, Saltburn-by-the-Sea.

Analytical Chemist. Studied Analytical Chemistry with Messrs. Pattinson and Stead, Borough Analysts, Middlesbrough. Attended special evening courses in Applied Chemistry at the Sheffield University. At present, Chemist to the Simon Carvé Bye-product, Coke Oven Construction and Working Co., Ltd.

J. E. Stead. Ernest W. Jackson.
H. Frankland. L. T. O'Shea.
R. B. Wight.

Ellis, Rowland Holliday, A.I.C.

Hope Cottage, Brayton Road, Selby,

Analytical Chemist. Associate of the Institute of Chemistry. Three years training in the Chemical Department, Leeds University. Five years Assistant to Mr. Thomas Fairley, F.R.S.E., etc., Leeds. For two years, and at present, Chief Chemist to the Olympia Oil and Cake Co., Selby.

Thomas Fairley. Arthur Smithells.
B. A. Burrell. J. B. Cohen.
H. M. Dawson.

Fleet, Wilfred James, F.H.A.S., F.E.S.,

"Imatra," King's Road, Bournemouth.

Tutor and Army Coach. Formerly Master and Lecturer on Agricultural Chemistry, 1896–7: Research in Chemistry of Manufacture, etc., of Tea, in Assam, India.

W. G. Sewell. *Chas. Umney.*
George Brownen. *Hubert Painter.*
W. Hunter Gandy. *W. J. Lewis.*

Garbutt, Cornelius Durham,

2, Hartington Road, Garston, Liverpool.

Analytical Chemist. Assistant for six years to G. Watson Gray, Esq., F.I.C.; studied Organic and Inorganic Chemistry at the Liverpool Technical College.

Harold A. Auden. James Smith.
John W. Towers. *Alexander Watt.*
Robert Redwood. *Andrew Turnbull.*
Boverton Redwood.

Gaul, Ernest George, M.Sc.,

The College, Holmes Chapel, Cheshire.

Lecturer in Chemistry at the College of Agriculture, Holmes Chapel,

Cheshire. Three years Student in the Honours School of Chemistry, Manchester University. One year Demonstrator in Sanitary Chemistry in the Public Health Laboratories, Manchester University.

Harold B. Dixon. Norman Smith.
W. H. Perkin. E. C. Edgar.
H. F. Coward. Alfred Holt.

Ghosh, Jyotish Chandra,
105, M. C. Ghosh's Lane, Howrah, India.

Secretariat Assistant, Army Department, India. Student for the last 18 months in the Chemistry Department of Manchester University; passed Inter. B.Sc. Selected by the Government of India to be trained as a Pharmaceutical Chemist for employment in Government Medical Stores Department. Author of "Notes on the Manufacture of (i) Drugs and (ii) Surgical Dressings" (Prepared for official use).

Harold B. Dixon. Norman Smith.
F. P. Burt. E. C. Edgar.
Alfred Holt. *A. Lapworth.*

Gibbins, Richard Ernest,
Clytha, Quinton Road, Coventry.

Chemist. Chemist at Messrs. Wyleys, Ltd., Manufacturing Chemists, Coventry. Passed Pharmaceutical Society's Exam. in 1901. Have studied Chemistry under Prof. Norman Collie in Pharmaceutical Society's School and previously at other Public Institutions. Chemist at General Apothecaries Co., London, W., five years. I am anxious to keep in touch with recent Chemical Research and to have access to the Society's publications.

W. F. Wyley. J. Norman Collie.
H. W. Jones. T. E. Wallis.
Ernest W. Mann.

Haines, Thomas Sidney,
73, Kennington Avenue, Bristol.

Junior Assistant in the State Medicine Laboratory, Bristol. Educated at Blackrock College, Co. Dublin. Student at King's College, London, 1906–10. Passed the Examination for the Associateship of the Institute of Chemistry, 1910. Passed the Examination for the Certificate in Biological Chemistry given by the Institute of Chemistry, November, 1911.

John Millar Thomson. Patrick H. Kirkaldy.
Herbert Jackson. Edward Russell.
Francis E. Needs

Heilbron, Isidor Morris, Ph.D. (Leipzig), F.I.C., A.G.I.C.,
7, Claremont Terrace, Glasgow.

Lecturer in Chemistry, Glasgow Technical College and Glasgow Veterinary College. Joint-author of several papers on Organic Chemistry published in the *Journal* and *Proceedings* of the Chemical Society and the *Berichte*. Joint-author of the book "The Identification of Organic Compounds."

G. G. Henderson. Cecil H. Desch.
Frederick Soddy. Thomas Gray.
Jas. A. Russell Henderson.

James, Charles,
Durham, N.H., U.S.A., and Pytchley Grange, Orlingbury, Wellingborough, England.

Associate Professor of Chemistry, New Hampshire College, Durham, N.H., U.S.A. Six years teaching in N.H. College; three-quarters of a year with National Refining Co., N.Y. City, U.S.A.; five years with Sir W. Ramsay. Fellow of the Institute of Chemistry. Published a number of papers upon rare earths in *Jour. Amer. Chem. Soc.*

William Ramsay. Samuel Smiles.
J. Norman Collie. R. Whytlaw-Gray.
N. T. M. Wilsmore.

McMillan, William,
72, Wellington Street, Greenock.

Chemist. Four years Assistant with Messrs. McCowan and Biggart, Analysts, Greenock. One year with Messrs. Beattie and Co., Sugar Manufacturers, Mauzanillo, Cuba. Chemist to Messrs. Tennants, Ltd., Sugar Manufacturers, San Fernando, Trinidad, B.W.I.

John Wm. Biggart. *Alex. C. Cumming.*
William Clacher. *J. P. Longstaff.*
Alexander Lauder. *Sydney A. Kay.*
T. W. Fagan.

McMyn, James William,
35, Snowdon Road, Eccles, Manchester.

Works Chemist. Student at Royal Salford Technical Institute, 1900–1906. Chief Chemist to Messrs. Arnold Dean & Co., Velvet Dyers, since 1906. Author of "Fluorescein as an Indicator for Coloured Solutions," *Journ. Soc. Dyers and Colourists*, March, 1910.

E. Green. E. Clark.
B. Prentice. J. R. Appleyard.
S. Duckworth.

Middleton, Herbert,
7, Howard Street, Horton Lane, Bradford.

Demonstrator in Chemistry, Technical College, Bradford. Have

passed through the three years' Course for Honours Chemistry at Manchester University, and one year's Research. Obtained Degrees of B.Sc. (Honours Chemistry), M.Sc. (Chemical Research).

Harold B. Dixon.	R. Robinson.
W. H. Perkin.	H. F. Coward.
Arthur Lapworth.	E. C. Edgar.
Norman Smith.	Alfred Holt.

Modi, Pestanji Manekji,

Meher Buildings, Tardeo, Bombay, India.

Junior Partner (Dr. E. M. Modi & Co.) and Superintendent, Arthur Road Chemical Works, Bombay. Graduated in Physics and Chemistry as a B.A. of the Bombay University in 1902; received further tuition for two years in Practical and Analytical Chemistry at St. Xavier's College, Bombay, under Prof. Father H. Kemp, S.J., and performed Analytical and Practical Technological Work at the Techno-Chemical Laboratory of Prof. T. K. Gajjar, M.A., B.Sc., etc., for about three years, and then joined Dr. Modi's Arthur Road Chemical Works (Bombay) as Superintendent, assisting his brother, Dr. E. M. Modi, D.Sc., LL.D., F.R.S.E., etc., in Analytical, Manufacturing, and Scientific Research Work for the last four years.

T. K. Gajjar.	A. R. Normand.
E. M. Modi.	G. R. Rele.

A. Pell.

Myers, Ernest Meyer,

c/o The Shelton Iron, Steel, and Coal Co., Ltd., Stoke-on-Trent.

Chemist and By-product Coke-Oven Manager. Studied Chemistry at the Central School of Science and School of Technology, Manchester; Technical School, Leeds, and the University of Sheffield. Silver Medallist in Gas Engineering (City and Guilds of London Institute). Two years Assistant Chemist to the Otto-Hilgenstock Coke-Oven Co., Ltd., and five years Chemist to the Grassmoor Colliery Co., Ltd., and Hasland Coking Co., Ltd., Chesterfield.

L. T. O'Shea.	R. L. Taylor.
A. E. Findlay.	F. W. Branson.

O. F. Kirby.

Naunton, William Johnson Smith, B.A. (Cantab.), B.Sc. (Lond.)

1, New Street, Woodbridge, Suffolk.

Research Student. Late Foundation Scholar, Exhibitioner, and Prizeman of St. John's College, Cambridge, and leaving Exhibitioner and Airy Memorial Prizeman of Woodbridge School. First Class in College Examinations, 1908; First Class, Natural Sciences Tripos, Part I, 1909. Second Class, Natural Sciences Tripos, Part II, 1911,

and First Class in the Final examination for Honours in the Faculty of Science of the University of London, 1911. Conjoint author with Dr. Siegfried Ruhemann of a paper on "Diphenyl*cyclo*pentenone." At present engaged in research

W. J. Pope. H. J. H. Fenton.
W. J. Sell. H. O. Jones.
S. Ruhemann. Charles T. Heycock.

Neilson, Richard Gillies,
Rangoon, Burma.

Junior Assistant Works Manager, Burma Oil Coy., Ld., Rangoon, Burma. Formerly Demonstrator in Chemistry; now Chief Chemist and Junior Assistant Works Manager, Burma Oil Coy., Ld., Rangoon, Burma.

W. Robertson. J. W. Shepherd.
Andrew Campbell. *Alfred Gordon Salamon.*
W. H. Hurtley. *Boverton Redwood.*
T. Martin Lowry.

Ogilvie, James Pettigrew,
"Honedale," Hendon Lane, Finchley, London, N.

Analytical Chemist. Certificated Student, City and Guilds of London Institute, Technical College, Finsbury. Late Chief Assistant, Newlands Bros., Analytical and Consulting Chemists.

R. Meldola. Charles A. Keane.
B. E. R. Newlands. L. J. de Whalley.
Arthur R. Ling. *Watson Smith.*

Parkes, John Wilfrid,
14, Gower Terrace, Willenhall.

Chemical Student. Post-graduate Research Student in the University of Birmingham.

Percy F. Frankland. C. K. Tinkler.
Hamilton McCombie. J. E. Coates.
Percy May.

Pope, Rupert William,
10, Malpas Road, Brockley, S.E.

Technical Research Chemist. B.Sc. Hons. London; Tuffnell Scholar, 1910–12. A.I.C. (Mineral Chemistry). Some investigations in Inorganic and Organic Chemistry which have not yet been published. At present engaged on some research work for Messrs. Strange and

Graham, Ltd., 50, City Road, E.C., under the direction of Sir William Ramsay, K.C.B.

J. Norman Collie. Samuel Smiles.
William Ramsay. N. T. M. Wilsmore.
F. E. Matthews.

Potter, Howard Vincent,

"Rosemount," Pollard Road, Whetstone, N.

Analytical and Pharmaceutical Chemist in Assay and Pharmaceutical laboratories of Messrs. Wright, Layman & Umney, Ltd. Council Silver Medallist (1910) of Pharmaceutical Society of Great Britain. Two years in School of Pharmacy of Pharmaceutical Society. Three months in research laboratory of Pharmaceutical Society under Prof. Crossley, D.Sc. Ph.D., F.R.S., F.I.C. Eighteen months in Assay laboratory of Messrs. Wright, Layman & Umney, Ltd., Pharmaceutical Chemists.

Arthur W. Crossley. John C. Umney.
Charles Dorée. C. T. Bennett.
Chas. Horne Warner.

Raitt, William,

Dehra Dun, U.P., India.

Cellulose Chemist and Chemical Engineer, and Cellulose Expert to the Government of India. Science Student, Baxter College (now University College), Dundee. Pupil (in Practical and Applied Chemistry) of Dr. Conrad Gerland, Ph.D., at the Blackburn Technical Institute, and of J. T. Ainslie Walker, Esq., F.C.S., Managing Director, Jeyes Sanitary Compounds, Co., Ltd. Author of articles on the chemistry and utilisation of new materials for Papermaking in *World's Paper Trade Review*, 27/9/07, 26/6/08, 2/4/09; *Tropical Agriculturist*, May, June, July, and August, '09, and Jan., '10; *Der Papier-Fabrikant*, Feb. 3rd and June 30th, 1911.

C. G. Moor. J. T. Ainslie Walker.
Puran Singh. *C. F. Cross.*
Edward Bevan.

Rayner, Edgar Alexander, B.Sc. (London),

71, Welldon Crescent, Harrow-on-the Hill.

Analytical Chemist. Six years with Messrs Johnson & Sons, Assayers, Ltd., 23, Cross Street, Finsbury, E.C.

Charles A. Keane. H. Y. Loram.
H. Burrows. H. R. Cooper.
C. Sordes Ellis.

Roberts, Alfred Reginald,

c/o Canada Cement Co., Shallow Lake, Ontario.

Cement Chemist. Three years Perse School, Cambridge. One year under Prof. Winterstein, Zürich, Switzerland; two years in research work on the rare metals with the Sunbeam Incandescent Lamp Co. Two years in Portland Cement Manufacture in Canada.

W. Lash Miller. W. H. Ellis.
W. R. Lang. *J. B. Leathes.*
H. S. Raper.

Roberts, Walter Morrell,

"The Cedars," Whalley Range, Manchester.

Research Student in Chemistry. Three years student in the Honours Course of Chemistry in the Manchester University; B.Sc. 1910. One year research student under Prof. Perkin; M.Sc. 1911.

Harold B. Dixon. Norman Smith.
W. H. Perkin. Arthur Lapworth.
R. Robinson.

Smart, Bertram James,

Travelling to Australia.

Officer in Charge, Government Testing Office, Lithgow, New South Wales. B.Sc. (London), Honours in Chemistry; nine years Research Chemist, Woolwich Arsenal. Joint author of papers with Silberrad on "Chemistry of Nitrogen Iodide: Preparation of *p*-Bistriazobenzene," *J. Chem. Soc.*, 1906, p. 170, 172; and with Robertson, "The Significance of the Abel Heat Test," *J. Soc. Chem. Ind.*, 1910, p. 130. Inventor and Patentee of Aluminium Alloys, Eng. Patents 14940, 1910; 9227, 1911.

Robert Robertson. J. T. Hewitt.
R. C. Farmer W. H. Gibson.
John Wade

Smith, Henry Edgar,

"The Mount," Dawley Salop

Student. M.Sc. (Birmingham) Priestley Research Scholarship, Chemistry, 1910; University Research Scholarship, Chemistry, 1911.

Percy F. Frankland. C. K. Tinkler.
Hamilton McCombie. Percy May.
Ernest Vanstone.

Smith, Richard,

6, Essex Road, Gorton, Manchester.

Analytical Chemist. Educated at the Municipal School of Technology, Manchester. Nine years Assistant Chemist in the laboratory

of Mr. Frank Scudder, F.I.C. Am desirous of keeping in touch with the latest chemical knowledge.

Frank Scudder. S. J. Peachey.
Robert Pettigrew. F. S. Sinnatt.
H. F. Coward.

Strivens, Percy Rudolph,

"The Crofts," Horbury, near Wakefield.

Analytical and Consulting Chemist. I received my training under Mr. R. W. Oddy, F.I.C., Analytical and Consulting Chemist of Rochdale, to whom I was Assistant for upwards of four years. For two years I was Chemist to Messrs. William Lynd & Co., Ltd., Oil Refiners and Soap Manufacturers, of Leeds. For the past six years I have been Chemist and Superintendent of the works of Messrs. John Reid & Son, Oil Distillers, Refiners, Oleine and Stearine Manufacturers, of Horbury. My research work, being of a private nature, has not been published.

William Marshall. Edward M. Chaplin.
Robt. W. Oddy. Thomas Fairley.
Sam. S. Pickles. *B. A. Burrell.*

Waldron, Cecil Hamersley,

28, Hungerford Road, Camden Road, London, N.

Member of the Literary Staff of Burroughs Wellcome & Co. Two years on the Analytical Staff of the Vinolia Soap Co. Five years on the Literary Staff of Burroughs Wellcome & Co., Manufacturing Chemists.

W. O. Wootton. Alex. McKenzie.
G. H. Martin. G. W. Clough.
Harold Deane. F. B. Power.
Henry Wren.

Wilson, Forsyth James, D.Sc., Ph.D.

96, Great George Street, Glasgow.

Lecturer in Chemistry, Glasgow and West of Scotland Technical College. I have published several papers on Organic Chemistry in the *Journal* and in the *Proceedings* of the Society, and in Liebig's *Annalen*. I studied chemistry at Edinburgh and Leipzig Universities.

G. G. Henderson. Cecil H. Desch.
Frederick Soddy. Thomas Gray.
Jas. A. Russell Henderson.

Withers, John Charles,

83, Edgeley Road, Clapham, S.W.

Ph.D. (Würzburg), 1910. Diploma in Chemistry of the Finsbury

Technical College, 1902–5. Assistant to Professor Groves, 1905–7. Now Assistant to Dr. M. O. Forster.

M. O. Forster.	H. F. Harwood.
G. T. Morgan.	F. P. Dunn.
James C. Philip.	H. V. A. Briscoe.
Chapman Jones.	W. N. Haworth.

Wood, John Kerfoot,

7, Airlie Terrace, Dundee.

Lecturer in Chemistry, University College, Dundee. D.Sc. (Vict.). Author of following papers published in *Transactions* of Chem. Soc.: "The Affinities of some Feebly Basic Substances," Vol. **83**, p. 568; "Bromo- and Hydroxy-derivatives of $\beta\beta\beta'\beta'$-Tetramethylsuberic acid," **89**, 604; "Acidic Constants of some Ureides and Uric Acid Derivatives," **89**, 1831; "Affinity Constants of Xanthine and its Methyl Derivatives," **89**, 1839; "Amphoteric Metallic Hydroxide," Part I., **93**, 411; Part II., **97**, 878. Also with Prof. James Walker, of papers published as follows: *Trans.*, 1898, **73**, 618; 1900, **77**, 21; 1900, **77**, 383; 1903, **83**, 484; 1906, **89**, 598. With E. A. Anderson: *Trans.*, 1909, **95**, 979. With J. D. Scott: *Trans.*, 1910, **97**, 1573.

Hugh Marshall.	J. C. Irvine.
G. D. Lander.	John Foggie.

John S. Lumsden.

The following Certificate has been authorised by the Council for presentation to Ballot under Bye-law I (3):

Duncan, John,

Victoria Street, Waterloo, Sydney, N.S.W.

Manufacturing Pharmaceutical Chemist. Chemical Works Superintendent.

J. A. Schofield.	H. A. D. Jowett.

Geo. E. Pearson.

R. CLAY AND SONS, LTD., BRUNSWICK ST., STAMFORD ST., S.E., AND BUNGAY, SUFFOLK.

[*Issued* 28/2/12

PROCEEDINGS

OF THE

CHEMICAL SOCIETY.

Vol. 28. No. 397.

Thursday, February 15th, 1912, at 8.30 p.m., Professor PERCY F. FRANKLAND, LL.D., F.R.S., President, in the Chair.

Certificates were read for the first time in favour of Messrs.:

Arthur Leslie Bartow, Kingscot, Ruislip.
Ernest Gower Bryant, 100, Burlington Street, Manchester.
Charles Rugeley Bury, B.A., Ellfield, Wotton-under-Edge, Glos.
James Grainger Hill, 124, Borneo Street, Walsall.
John Owen Hughes, B.Sc., University College of N. Wales, Bangor.
Edgar Dingle Jones, 3, Neville Road, Waterloo, Liverpool.
Richard Arnold Seymour-Jones, M.Sc., Lyddon Hall, Virginia Road, Leeds.
William Thornton Lucas, B.A., 62, Mowbray Road, South Shields.
Bawa Kartar Singh, B.A., Dacca College, Dacca, Bengal.

The PRESIDENT made the following announcements:

(1) That the Council had proposed the following gentlemen as Honorary and Foreign Members, and that a ballot for their election would take place at the Ordinary Scientific Meeting of the Society to be held on Thursday, March 7th:

Professor Philippe A. Guye (Geneva).
Professor Thomas Burr Osborne (Newhaven, Conn.).
Professor Paul Walden (Riga).
Professor Richard Willstätter (Zurich).

(2) That the following changes in the Officers and Council were proposed by the Council:

Vice-Presidents to retire: Prof. J. Norman Collie and Prof. James Walker.

Secretary to retire: Prof. G. T. Morgan.

Ordinary Members of Council to retire: Prof. J. B. Cohen, Mr. C. F. Cross, Mr. C. E. Groves, and Dr. A. E. H. Tutton.

As President: Prof. Percy F. Frankland.

As Vice-Presidents who have filled the office of President: Prof. H. E. Armstrong, Prof. A. Crum Brown, Sir William Crookes, Sir James Dewar, Prof. H. B. Dixon, Dr. A. G. Vernon Harcourt, Prof. R. Meldola, Dr. H. Müller, Prof. W. Odling, Sir William Ramsay, Prof. J. Emerson Reynolds, the Right Hon. Sir Henry E. Roscoe, Sir Edward Thorpe, and Sir William A. Tilden.

As Treasurer: Dr. Alexander Scott.

As Hon. Secretaries: Prof. Arthur W. Crossley and Dr. Samuel Smiles.

As Foreign Secretary: Dr. Horace T. Brown.

As Vice-Presidents: Dr. G. T. Beilby, Dr. M. O. Forster, Prof. A. Liversidge, Prof. E. J. Mills, Prof. G. T. Morgan, and Prof. W. J. Pope.

As New Ordinary Members of Council: Dr. H. G. Colman, Dr. A. Harden, Dr. T. M. Lowry, and Dr. E. J. Russell.

(3) That Prof. P. F. Frankland had been appointed to represent the Society at the funeral of the late Lord Lister, P.C., O.M., F.R.S.

(4) That with the object of keeping the Library as up-to-date as possible, the Council would especially welcome the gift of works written by Fellows of the Society.

Dr. F. B. Power, Prof. J. Millar Thomson, and Dr. Samuel Rideal were elected Auditors to audit the Society's Accounts.

A ballot for the election of Fellows was held, and the following were subsequently declared elected:

Hilmar Johannes Backer.
Clement William Bailey, M.Sc.
Fred Barrow, M.Sc., Ph.D.
Ernest Arthur Bearder, M.Sc.
Gibbs Blackstock, B.A.
James Ewart Bridge, B.Sc.
David Brownlie, B.Sc.
Thomas Alfred Brunjes.
Sidney Waterfield Bunker, B.Sc.
William Thomas Clarke, B.Sc.
Tom Peach Colclough, M.Sc.
Frederic Fernandez Curtis.
Surendranath De.
Thomas Sharp Dick.
Harold Forster Dodson.
John Duncan.
Rowland Holliday Ellis.
Wilfred James Fleet.
Cornelius Durham Garbutt.
Ernest George Gaul, M.Sc.
Jyotish Chandra Ghosh.
Richard Ernest Gibbins.
Thomas Sidney Haines.
Isidor Morris Heilbron, Ph.D.
Charles James.
William McMillan.
James William McMyn.
Herbert Middleton, M.Sc.
Pestanji Manekji Modi, B.A.
Ernest Meyer Myers.
William Johnson Smith Naunton, B.A., B.Sc.
Richard Gillies Neilson.
James Pettigrew Ogilvie.
John Wilfred Parkes.
Rupert William Pope, B.Sc.
Howard Vincent Potter.
William Raitt.
Edgar Alexander Rayner, B.Sc.
Alfred Reginald Roberts.
Walter Morrell Roberts, M.Sc.
Bertram James Smart, B.Sc.
Henry Edgar Smith, M.Sc.
Richard Smith.
Percy Rudolph Strivens.
Cecil Hamersley Waldron.
Forsyth James Wilson, D.Sc., Ph.D.
John Charles Withers, Ph.D.
John Kerfoot Wood, D.Sc.

Of the following papers, those marked * were read:

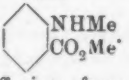
***25. "Perhalides of diphenyliodinium iodide."**
By Martin Onslow Forster and Johannes Heinrich Schaeppi.

The *tetrachloride*, *dichloride*, *iodochloride*, *dibromide*, and *iodobromide* of diphenyliodinium iodide were described, together with the *dibromide* and *di-iodide* of diphenyliodinium bromide and the *dibromide* and *iodide* of diphenyliodinium chloride.

DISCUSSION.

SIR WILLIAM TILDEN said that this paper interested him because the preparation and properties of certain periodides had been the subject of the first communication he ever made to the Chemical Society. It was curious to notice that the problem presented by the exterior atoms of halogen in these compounds appeared to be in nearly the same position as it was forty years ago. He inquired whether the new compounds presented in the crystalline form the power of polarising ordinary light exhibited by so many of those already known, as, for example, the substance formerly called "herapathite."

***26. "The constitution and synthesis of damascenine, the alkaloid of Nigella damascene" By Arthur James Ewins.**

Damascenine has been proved by synthesis to be the methyl ester of 2-methylamino-3-methoxybenzoic acid,  . It thus possesses the composition $C_{10}H_{13}O_3N$, differing from the formula originally suggested by Schneider (*Pharm. Centr.-h.*, 1890, **31**, 173) only by having two hydrogen atoms less. The formula $C_9H_{11}O_3N$, assigned to this alkaloid by Pommerehne (*Arch. Pharm.*, 1900, **238**, 531), and the betaine-like constitution suggested by Keller (*Arch. Pharm.*, 1908, **246**, 1) are therefore without foundation, the "damascenine hydrochloride" of these workers being a mixture of the hydrochlorides of damascenine and damasceninic acid.

***27. "The action of ozone on cellulose." By Mary Cunningham and Charles Dorée.**

Ozone (concentration 1 to 2 per cent.) rapidly attacks cotton, forming a cellulose peroxide and an acid derivative, together with some carbon dioxide. The peroxide is decomposed at 80°. The acid may be removed by boiling with water or digestion with *N*/10-alkali; the neutral fibre residue then obtained is an oxycellulose. The acidity and the amount of carbon dioxide produced during treatments varying from one to twenty hours have been measured, and the constants of the oxycellulose determined and compared with typical oxycelluloses.

The lignocellulose jute is not appreciably affected unless water is present. In that case it is oxidised, giving carbon dioxide, acetic and formic acids, and complex non-volatile acids which yield furfuraldehyde. Quantitative measurements of the progressive action of the ozone show that the lignone group is rapidly attacked in the first three hours, after which the action becomes slower, the residue being then oxidised uniformly. The lignin reactions cease when the loss of weight is about 33 per cent. Direct evidence of ozonide formation has not been obtained, although the formation of acetic and formic acids appears to be due to the decomposition of some product formed, in the first instance, by the action of ozone.

***28. "Hydroxymethylphosphinic acid and some homologues." By Harold James Page.**

Fossek found that when an aldehyde (3 mols.) and phosphorus trichloride (1 mol.) were mixed, an unstable viscous oil resulted.

When this was treated with water, two-thirds of the original aldehyde was regenerated, together with hydrogen chloride and α-hydroxy-alkyl(or aryl)-phosphinic acid,

$$3R\cdot CHO + PCl_3 = [3R\cdot CHO, PCl_3] \xrightarrow{H_2O} 2R\cdot CHO + 3HCl + R\cdot CH(OH)\cdot PO_3H_2.$$

Fossek's results have been confirmed, and the above reactions further examined. An attempt to distil the intermediate oil in a vacuum was fruitless. An explanation of the mechanism of the reaction and of the constitution of the intermediate oil was, however, advanced.

The first member of the series, namely, hydroxymethylphosphinic acid, was not prepared by Fossek. It has been obtained in a 93 per cent. yield by the action of trioxymethylene on phosphorus trichloride, and it has been shown that it is also produced by the action of formaldehyde on phosphorus trichloride, although not in a pure state.

Hydroxymethylphosphinic acid, $CH_2(OH)\cdot PO_3H_2$, is in most respects similar to the other members of the series; as typical member, however, it exhibits certain anomalous properties.

Discussion.

Mr. C. Hollins drew attention to the ethereal oxygen linking in one of the suggested intermediate compounds, and asked the author whether the acids showed any tendency to form inner anhydrides.

Dr. J. F. Spencer pointed out that all the compounds described, except the first member of the series, contained asymmetric carbon atoms, and asked whether the author had any evidence of the existence of the two optically active isomerides in any of the compounds examined.

Mr. Page replied that no indication of the formation of an inner anhydride had been observed, and that he proposed to attempt the resolution of some of the acids.

29. "Chemical examination of scammony root and of scammony." ederick Belding Power and Harold Rogerson.

The material employed for this investigation consisted of Levant scammony root (from *Convolvulus Scammonia*, Linné), and the product known as scammony, or "virgin scammony," the latter having been obtained directly from Smyrna.

The scammony root yielded 9·65 per cent. of resin, 97 per cent.

of which was soluble in ether, whereas the gum-resin, scammony, contained 83·1 per cent. of resin, which was completely soluble in ether. The specific rotatory power of the two crude resins was $[\alpha]_D$ −20·20° for that obtained from the root, and $[\alpha]_D$ −21·15° for that from scammony.

For a complete examination of the root, 50·35 kilograms of the ground material were extracted with hot alcohol. The resulting extract, when distilled in a current of steam, yielded a very small amount of an essential oil. From the portion of the extract which was soluble in water the following substances were isolated: scopoletin, $C_{10}H_8O_4$; 3:4-dihydroxycinnamic acid, $C_9H_8O_4$; and a small amount of sucrose. The aqueous liquid contained, furthermore, a quantity of dextrose. The portion of the alcoholic extract which was insoluble in water consisted of a resin which possessed the above-mentioned characters.

The resins obtained from scammony root and from scammony respectively, sometimes designated as "scammonin," are very similar in many respects, but not perfectly identical. On the other hand, the resin of scammony root was found to differ very considerably from that obtained from the root of *Ipomoea orizabensis* (*Trans.*, 1912, **101**, 1), which has received the appellation of "jalapin." Both of these resins consist of exceedingly complex mixtures, and their components are not entirely glucosidic.

30. "Experiments on the Walden inversion. Part VIII. α-Amino-α-phenylpropionic acids." By Alex. McKenzie and George William Clough.

dl-α-Formylamino-α-phenylpropionic acid was resolved into its optically active components by cinchonidine and quinine, and the amino-acids were prepared by hydrolysing the active formyl compounds with hydrobromic acid. The following values were obtained:

	$[\alpha]_D$	
d-α-Formylamino-α-phenylpropionic acid	+91·9°	in ethyl-alcoholic solution.
l- ,, ,, ,,	−91·6	,, ,,
d-α-Amino-α-phenylpropionic acid	+70·0	in aqueous solution.
l- ,, ,, ,,	−69·5	,, ,,

Complete racemisation took place with the formation of *r*-atrolactinic acid when the amino-group in the active amino-acids was displaced by the hydroxy-group by means of nitrous acid. Again, when the *d*-amino-acid was acted on by a mixture of fuming hydrochloric acid and sodium nitrite, the racemisation was practically complete.

31. **"Preparation of the nitrites of the primary, secondary, and tertiary amines. Part I." By Pañchānan Neogi.**

A detailed description was given of the preparation of the nitrites of the primary, secondary, and tertiary amines, a preliminary account of which has already appeared (*Proc.*, 1911, **27**, 242).

32. **"Nitrites of the mercurialkyl- and mercurialkylaryl-ammonium series." By Prafulla Chandra Rây, Jitendra Nath Rakshit, and Rasik Lal Datta.**

By the interaction of mercuric nitrite and the alkyl- and alkylaryl-amines the following mercury-substituted alkyl- and alkylarylammonium nitrites have been obtained: Trimercuridibutylammonium nitrite (compare *Trans.*, 1911, **99**, 1972), *mercuriisobutylammonium nitrite, mercuribenzylammonium nitrite, mercuridiphenylammonium nitrite, mercuridi-p-tolylammonium nitrite, mercuridibenzylmethylammonium nitrite, mercuridibenzylethylammonium nitrite, mercuridipyridinium nitrite, mercuridiquinolinium nitrite, mercuridinaphthylammonium nitrite*, and *mercuripiperazinium nitrite*.

33. **"Nitrites of the alkylammonium series. Part IV. *iso*Butyl-, diethyl-, dipropyl-, and tripropyl-ammonium nitrites." By Prafulla Chandra Rây and Jitendra Nath Rakshit.**

By the usual method, namely, double decomposition between the corresponding substituted ammonium chloride and silver nitrite, the above nitrites have been obtained. Of these, *iso*butylammonium nitrite and tripropylammonium nitrite are liquids. Diethyl- and dipropyl-ammonium nitrites are crystalline compounds, and can be sublimed in a vacuum without decomposition.

34. **"The hydrolysis and saponification of esters of saturated and unsaturated acids." By Thomas Williams and John Joseph Sudborough.**

The hydrolysis of the ethyl esters of propionic, acrylic, *n*-butyric, crotonic, *β*-phenylpropionic, and cinnamic acids by means of dilute hydrochloric acid have been determined at 20°, and also the saponification values of the same esters by means of dilute barium hydroxide.

The results indicate that an unsaturated ester is not nearly so

quickly hydrolysed as its saturated analogue by means of dilute hydrochloric acid. With the three pairs of esters examined, the constant for the saturated ester is about thirty times as great as that for the unsaturated.

The differences in the saponification values are not so marked, and when the unsaturated acid is much stronger than the saturated, as is the case with acrylic and propionic acids, the ester of the unsaturated acid can be saponified more rapidly than its saturated analogue.

35. "Investigations on the dependence of rotatory power on chemical constitution." (Preliminary note.) By Robert Howson Pickard and Joseph Kenyon.

The authors are continuing their investigations, and now find that the method (see *Trans.*, 1911, **99**, 45) of resolving racemic alcohols into their optically active components can be applied to many types of secondary alcohols. For the purposes of these investigations it has already appeared desirable to contrast the properties of series of very closely allied compounds. It is not proposed therefore to publish details of the preparation of isolated members of such series, but the authors desire to reserve this field of research.

Complete resolutions have been effected in the case of the following alcohols, the figures being the rotation, α_D, in a 100 mm. tube at the temperature of the laboratory:

*Methyl*tert.-*butylcarbinol*, $\pm 6{\cdot}4°$; *α-naphthylmethylcarbinol*, $\pm 16{\cdot}0°$; *ethylpropylcarbinol*, $\pm 1{\cdot}5°$; *ethyl*iso*butylcarbinol*, $\pm 16{\cdot}3°$; *propyl*iso*butylcarbinol*, $\pm 2{\cdot}2°$; *benzylmethylcarbinol*, $\pm 26{\cdot}6°$; *phenylethylmethylcarbinol*, $\pm 14{\cdot}0°$. Further experiments have shown that the resolution of the following can also be readily carried out: *cinnamylmethylcarbinol*, cyclo*hexylmethylcarbinol*, iso*propyl*iso*butylcarbinol*, and *phenyl-o-tolylcarbinol*.

It is further proposed to include in the scope of the investigations such acids as have analogous constitutions to the optically active alcohols obtained. In some preliminary experiments carried out in conjunction with G. T. Byrne, the following optically active acids have been obtained: *α-phenylpropionic acid*, $[\alpha]_D^{20}$ $+91{\cdot}8°$, and *α-phenylbutyric acid*, $[\alpha]_D^{20}$ $+84{\cdot}8°$.

36. **"The methyl, ethyl, and *iso*butyl esters of di-trichloroacetyltartaric acid, and the existence of minima in their temperature-rotation curves." By Thomas Stewart Patterson and Alfred Davidson.**

The preparation of the methyl, ethyl, and *iso*butyl esters of di-trichloroacetyltartaric acid was described; the rotation values of these esters were quoted and compared amongst themselves and with the data for other analogous compounds. The existence of minima in the temperature-rotation curves of the esters was also commented on.

ADDITIONS TO THE LIBRARY.

I. *Donations.*

American Society for Testing Materials. Memorial volume commemorative of the life and life-work of Charles Benjamin Dudley. Philadelphia, Pa. [n.d.]. pp. 269. ill. (*Recd.* 31/1/12).

From the Society.

Church, *Arthur Herbert.* Church's laboratory guide. A manual of practical chemistry . . . specially arranged for agricultural students. Revised and partly rewritten by *Edward* **Kinch.** 9th edition. London 1912. pp. xvi + 368. ill. 6*s.* 6*d.* net. (*Recd.* 23/1/12.)

From Professor Edward Kinch.

Dudley, *Charles Benjamin.* See **American Society for Testing Materials.**

Nisbet, *Harry.* Theory of sizing. Manchester 1912. pp. xi + 75. ill. 2*s.* 6*d.* net. (*Recd.* 10/2/12.)

From the Publishers: Messrs. Emmott and Co., Ltd.

II. *By Purchase.*

Bechhold, *H.* Die Kolloide in Biologie und Medizin. Dresden 1912. pp. xii + 441. ill. M.14.—. (*Recd.* 14/2/12.)

Hammarsten, *Olof.* A text book of physiological chemistry. Authorized translation from the . . . seventh German edition by *John A.* **Mandel.** 6th edition. New York 1911. pp. viii + 964. 17*s.* net. (*Recd.* 14/2/12.)

Lange, *Otto.* Die Schwefelfarbstoffe, ihre Herstellung und Verwendung. Leipzig 1912. pp. xii + 497. ill. M.22.—. (*Recd.* 14/2/12.)

Schultz, *Gustav.* Farbstofftabellen. 5th edition of *Tabellarischen Uebersicht der künstlichen organischen Farbstoffe.* Lief. I. Berlin 1911. M.3.—. (*Reference.*)

MOISSAN MEMORIAL LECTURE.

An Extra Meeting will be held on Thursday, February 29th, 1912, at 8.30 p.m., when the Moissan Memorial Lecture will be delivered by Sir William Ramsay, K.C.B., F.R.S.

VAN'T HOFF MEMORIAL.

Subscriptions to this fund may be sent to the Treasurer of the Society (Dr. Alexander Scott). The amount already received amounts to £21 8*s.* 6*d.*

The next Ordinary Scientific Meeting will be held on **Thursday, March 7th**, 1912, at **8.30** p.m., when there will be a ballot for the election of Honorary and Foreign Members, and the following papers will be communicated:

"Isomeric change of diacylanilides into acylaminoketones. Transformation of dibenzoyl-*p*-chloro(and -*p*-bromo)-aniline into the isomeric benzoylchloro(and bromo)-aminobenzophenone." By A. Angel.

"The chemistry of the glutaconic acids. Part III. Glutaconic acid and its β-alkyl derivatives." By N. Bland and J. F. Thorpe.

"Asymmetric quinquevalent nitrogen compounds of simple molecular constitution." By W. J. Pope and J. Read.

"The interaction of phosphorus and potassium hydroxide solution." By M. N. Banerjee.

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[*Issued* 15/3/12

PROCEEDINGS

OF THE

CHEMICAL SOCIETY.

Vol. 28. No. 398.

Thursday, March 7th, 1912, at 8.30 p.m., Professor J. NORMAN COLLIE, Ph.D., F.R.S., Vice-President, in the Chair.

Messrs. H. J. Backer, John C. Withers, George A. Stokes, Rowland H. Ellis, B. C. Smith, and Thomas A. Brunjes were formally admitted Fellows of the Society.

Certificates were read for the first time in favour of Messrs.:

Daniel Arkell, B.Sc., Oratory School, Birmingham.
Evelyn Ashley Cooper, B.Sc., Arborfield, Woodcote Valley Road, Purley, Surrey.
Frederick Charles Eastick, B.A., The Drive, South Woodford.
John Burke Farlie, jun., 54, Wellington Road, Old Charlton, S.E.
Oliver Richard Howells, B.Sc., Bracondale School, Norwich.
James O'Mara, B.A., Dunlica, College Road, Dulwich, S.E.
John Rennie, Maisonette, Rufford Park, Yeadon, Leeds.
Arthur Thompson, Bryn Teg, Chetwynd Road, Wolverhampton.

A ballot for the election of Honorary and Foreign Members was held, and the following were subsequently declared duly elected:

Prof. Philippe A. Guye (Geneva).
Dr. Thomas Burr Osborne (Newhaven, Conn.).
Prof. Paul Walden (Riga).
Prof. Richard Willstätter (Zürich).

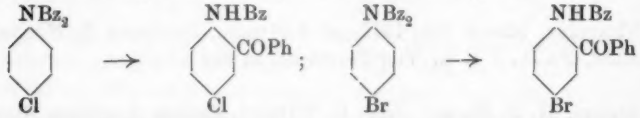
The names of the Fellows recommended by the Council for election as Officers and as Ordinary Members of Council for the year 1912 to 1913 were read from the Chair.

Of the following papers, those marked * were read:

***37. "Isomeric change of halogen-substituted diacylanilides into acylaminoketones." By Andrea Angel.**

The isomeric change of diacylanilides into derivatives of *o*-aminobenzophenone, which has been shown to occur (*Trans.*, 1904, **85**, 386) under the influence of heat and a catalyst when an alkyl group is present in the para-position with respect to the nitrogen atom, has been found to take place in a similar manner if negative para-substituents such as chlorine or bromine are present in the acylated aniline.

Dibenzoyl-p-*chloroaniline* and *dibenzoyl*-p-*bromoaniline* undergo rearrangement into 5-*chloro*-o-*benzoylaminobenzophenone* and 5-*bromo*-o-*benzoylaminobenzophenone* respectively, thus:



These are pale yellow, crystalline substances, melting at 108° and 122° respectively, which are with some difficulty hydrolysed to the corresponding aminohalogenbenzophenones.

5-*Bromo*-o-*aminobenzophenone* (m. p. 111°) resembles the chloro-compound (*loc. cit.*, p. 344) very closely. It crystallises from dilute alcohol in bright yellow needles, and is somewhat volatile in steam. It is a weak base, forming crystalline salts with acids, which, however, are so readily hydrolysed that they turn yellow in moist air.

***38. "Studies in the camphane series. Part XXXII. Stereoisomeric modifications of *iso*nitroso-epicamphor, the third and fourth monoximes of camphorquinone." By Martin Onslow Forster and Hans Spinner.**

Although arylimino-derivatives of camphor, when heated with hydroxylamine hydrochloride and sodium acetate, yield either ordinary *iso*nitrosocamphor or the dioxime of camphorquinone (*Trans.*, 1909, **95**, 942), there are produced from phenyliminocamphor in presence of alkali two isomeric oximes. The *α-oxime*, $C_8H_{14}<\begin{matrix}C{:}N\cdot C_6H_5\\ C{:}NOH\end{matrix}$, crystallises from alcohol in massive, transparent,

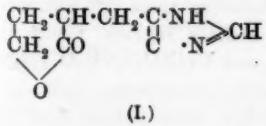
sulphur-yellow prisms, melting at 112°, and has $[\alpha]_D$ 335·4°. The *β-oxime* separates less readily from alcohol, but does not dissolve so freely as the isomeride in benzene, chloroform, or petroleum; it crystallises in very pale brown needles melting at 172°, and has $[\alpha]_D$ 304·4°. This modification is transformed into the isomeride when heated above the melting point.

iso*Nitroso-epicamphor*, $C_8H_{14}\begin{cases}CO\\C{:}NOH\end{cases}$, as obtained by hydrolysing the α-oxime of phenyliminocamphor with dilute hydrochloric acid, melts at 137°, and has $[\alpha]_D$ −179·4°. If the fused substance is heated further, it becomes semi-solid owing to transformation into a more stable isomeride, which is conveniently produced by boiling an aqueous solution of the unstable one; this form of *iso*nitroso-epicamphor crystallises from water in long, lustrous, flat needles, melting at 170°, and has $[\alpha]_D$ −200·1°. The two substances differ markedly as regards their solubility in petroleum, and they form distinct benzoyl derivatives; both develop with alkali hydroxide the yellow coloration characteristic of *iso*nitroso-ketones, and the diluted solution yields with ferrous sulphate a bluish-violet precipitate resembling that given by *iso*nitrosocamphor. Phenylhydrazine leads to an oxime of camphorquinonephenylhydrazone, whilst hydroxylamine gives rise to a dioxime of camphorquinone. Hence it seems clear that the new *iso*nitroso-ketones have to epicamphor (Lankshear and Perkin, *Proc.*, 1911, **27**, 166) the relationship borne by the two modifications of *iso*nitrosocamphor towards camphor itself.

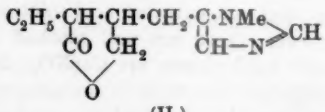
The production of *iso*nitroso-epicamphor in two forms therefore completes the series of oximes theoretically obtainable from camphorquinone; four dioximes and four monoximes are now known.

***39. "The synthesis of glyoxaline derivatives allied to pilocarpine." By Frank Lee Pyman.**

The *lactone* of *α(β-hydroxyethyl-)β-glyoxaline-4*(or 5)*-propionic acid* (I), which has certain constitutional features in common with pilocarpine (II), has been prepared by hydrolysing *ethyl* 4(or 5)*-glyoxalinemethyl-γ-phenoxyethylmalonate*, a product obtained by the action of 4(or 5)-chloromethylglyoxaline on ethyl γ-phenoxyethylmalonate:



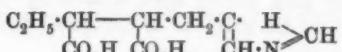
(I.)



(II.)

Neither this base nor an *N*-methyl derivative has any pronounced physiological action.

α-4(or 5)-*Glyoxalinemethyl-β-ethylsuccinic acid* (III), a compound



(III.)

containing the skeleton of pilocarpine, has been prepared by condensing 4(or 5)-chloromethylglyoxaline with ethyl α-cyano-β-ethylsuccinate, and hydrolysing the resulting *ethyl* α-4(or 5)-*glyoxalinemethyl-α-cyano-β-ethylsuccinate*. Its *ethyl* ester proved to be physiologically inactive. The preparation of 4(or 5)-*glyoxalineformaldehyde*, $C_3H_3N_2 \cdot CHO$, was also mentioned, and a description given of the free base, 4(or 5)-*β-aminoethylglyoxaline*.

***40. "Calcium nitrate. Part I. The two-component system, calcium nitrate, water. Part II. The three-component system, calcium nitrate, nitric acid, water at 25°." By Henry Bassett, jun., and Hugh Stott Taylor.**

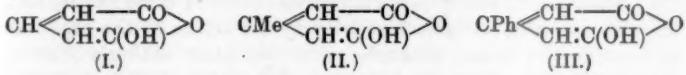
The solubility of calcium nitrate in water has been studied between the temperatures of −28·7° (the cryohydric temperature) and 151° (the boiling point of the saturated solution). There are only three hydrates of calcium nitrate, namely, $Ca(NO_3)_2,4H_2O$, $Ca(NO_3)_2,3H_2O$, and $Ca(NO_3)_2,2H_2O$, each of which is stable in contact with its saturated solution over a definite range of temperature. The tetra- and tri-hydrates have true melting points.

The solubility of calcium nitrate increases rapidly with rise of temperature throughout the range of existence of the several hydrates, but at 51°, where the anhydrous $Ca(NO_3)_2$ becomes the stable solid phase, the solubility reaches a value which hardly changes with further rise of temperature.

The addition of nitric acid lowers the solubility of calcium nitrate, and at the same time promotes dehydration. Solubility determinations have been made at 25° between the limits of nitric acid concentration of 0 and 98 per cent. In contact with pure water and dilute nitric acid solutions, $Ca(NO_3)_2,4H_2O$ is the stable solid phase, whilst the anhydrous $Ca(NO_3)_2$ is alone stable in presence of the most concentrated acid solutions. Between these two extremes, however, there are well marked intermediate regions, where the stable solid phases are $Ca(NO_3)_2,3H_2O$ and $Ca(NO_3)_2,2H_2O$ respectively.

41. "The chemistry of the glutaconic acids. Part III. Glutaconic acid and its β-alkyl derivatives." By Norman Bland and Jocelyn Field Thorpe.

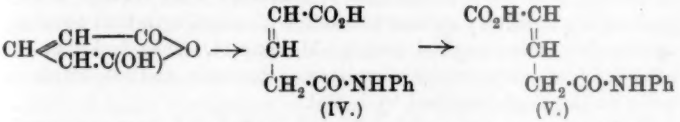
Glutaconic acid, β-methylglutaconic acid, and β-phenylglutaconic acid readily yield hydroxy-anhydrides of the formulæ (I), (II), and (III) respectively:



(I.) (II.) (III.)

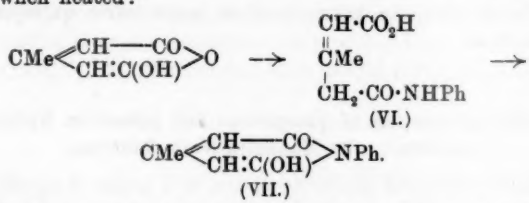
These compounds are monobasic acids, and give intense colorations with ferric chloride.

Glutaconic acid behaves towards aniline in the same manner as its α-mono-substituted derivatives, and the *cis*-semianilide prepared from the hydroxy-anhydride and aniline (IV) passes into the *trans*-semianilide (V) when heated:



(IV.) (V.)

The hydroxy-anhydrides from the β-substituted acids yield, on the other hand, semianilides (VI), which pass into hydroxy-anils (VII) when heated:



(VI.)

(VII.)

The hydroxy-anils behave on titration as monobasic acids, but their salts are stable, and do not regenerate the salts of the semianilide when heated. It is evident that the attachment of an alkyl group to the β-carbon atom of glutaconic acid confers increased stability on those forms of the derivatives of the acids which have the mobile hydrogen outside the three-carbon system.

42. "Asymmetric quinquevalent nitrogen compounds of simple molecular constitution." By William Jackson Pope and John Read.

In 1891 LeBel described the preparation of methylethylpropyl*iso*-butylammonium salts, and the manner in which, by the action of

Penicillium glaucum on a solution of the corresponding chloride, he obtained a solution which exhibited a small rotatory power; from this observation LeBel concluded that he had succeeded in obtaining optical activity which could be associated with the presence of an asymmetric quinquevalent nitrogen atom.

In 1899 Marckwald prepared salts of the above-named base by the interaction of methylpropyl*iso*butylamine and ethyl iodide, and, since he obtained no optical activity by the action of the organism as described by LeBel, concluded that the latter author's observations were not correct. In a reply to Marckwald, LeBel attributed the failure to confirm his observations to the production of a different quaternary ammonium iodide by Marckwald's process and his own, which consisted in causing ethylpropyl*iso*butylamine to combine with methyl iodide.

The authors have prepared ethylpropyl*iso*butylamine in a state of purity, and have found that it combines with methyl iodide, yielding a quaternary ammonium iodide identical with that obtained by the alternative method used by Marckwald. They find that the behaviour of ethylpropyl*iso*butylamine towards methyl iodide is quite unlike that described by LeBel.

It is consequently concluded that LeBel did not succeed in preparing methylethylpropyl*iso*butylammonium iodide, and that he did not obtain a substance of which the optical activity could be associated with the presence of an asymmetric quinquevalent nitrogen atom.

43. "The interaction of phosphorus and potassium hydroxide solution." By Manindra Nath Banerjee.

An explanation was given, by means of a series of equations, of the mechanism of the reaction between phosphorus and potassium hydroxide solution.

44. "The triazo-group. Part XX. Azoimides of the propane series" By Martin Onslow Forster and John Charles Withers.

By methods, the principles of which are familiar, *γ-triazopropylamine* was prepared along with *β-triazopropylamine*, which it greatly exceeds in stability, resembling β-triazoethylamine. *αγ-Bistriazoisopropyl alcohol* and *αβ-bistriazopropyl alcohol* were described, together with the respective *bistriazochloropropanes*; from the former of these *αγ-bistriazopropylene* has been obtained.

45. "Viscosity and association. Part II. The viscosity of geometrical isomerides." By Ferdinand Bernard Thole.

The author has determined the viscosity of a large number of geometrical isomerides, typical members of the ethylenic compounds, the oximes and the phenylhydrazones being examined.

From the results certain general rules have been drawn, by help of which it has been possible to confirm the formulæ for the camphorquinonephenylhydrazones suggested by Forster and Zimmerli (*Trans.*, 1911, **99**, 478), and to assign formulæ to the acetaldehydephenylhydrazones described by Lockemann and Liesche (*Annalen*, 1905, **34**, 214).

46. "The chemistry of the glutaconic acids. A correction." By Jocelyn Field Thorpe.

In Part I of this series (*Trans.*, 1911, **99**, 2188) the work previously recorded on the alkylation of esters of the type of ethyl glutaconate was summarised, and it was concluded that under certain conditions the hydrogen atom of the complex X·CH: could be displaced by sodium through the agency of alcoholic sodium ethoxide.

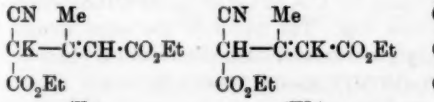
This conclusion was based on the formation of $\alpha\beta\gamma$-trimethylglutaconic acid (IV) from the ester (III), which was obtained from the ester (II) by the action of sodium ethoxide and methyl iodide; the structure of the last-named substance being evident owing to its formation from the potassium compound (I) and methyl iodide:

$$\underset{\text{(I.)}}{CO_2Et\cdot CK(CN)\cdot CMe{:}CH\cdot CO_2Et} \longrightarrow \underset{\text{(II.)}}{CO_2Et\cdot CMe(CN)\cdot CMe{:}CH\cdot COEt}$$

$$\longrightarrow \underset{\text{(III.)}}{CO_2Et\cdot CMe(CN)\cdot CMe{:}CMe\cdot CO_2Et}$$

$$\longrightarrow \underset{\text{(IV.)}}{CO_2H\cdot CHMe\cdot CMe{:}CMe\cdot CO_2H}$$

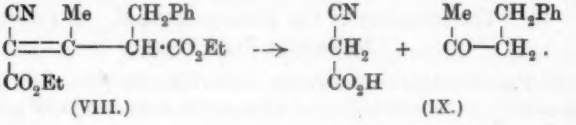
In the original paper (*Trans.*, 1905, **87**, 1674) two possible structures for this potassium compound were considered, namely, (V) and (VI), and of these formula (V) was regarded as the more probable because of the strongly negative character of the hydrogen atom displaced. It is, however, evident, in view of the presence of the mobile hydrogen atom which has since been demonstrated, that there is still another possibility, which is represented by formula (VII):



(V.) (VI.) (VII.)

In a recent communication (*Trans.*, 1912, **101**, 249) it was shown that the esters of substituted glutaconic acids containing the mobile hydrogen atom react with sodium ethoxide so as to retain this hydrogen, and it is therefore evident that if this statement is true the potassium compound must have the formula (VII), because in order to form a compound of formula (V) the ester would have to part with its mobile hydrogen atom.

Fortunately, it is a very simple matter to prove that the potassium compound has the structure represented by formula (VII), because, when the metal is displaced by benzyl, an ester (VIII) is produced, which is hydrolysed with remarkable ease by alkali hydroxide, yielding cyanoacetic acid and benzylacetone (IX):



(VIII.) (IX.)

It is proposed to give the full experimental details of this curious reaction in a subsequent communication, but it may be stated here that the benzylated ester (VIII) exists in two well-defined modifications, one giving a coloration with ferric chloride and dissolving in alkali, the other giving no coloration and being insoluble in alkali. It is the soluble ester only which undergoes disruption in the above manner. There is, then, no reason to assume that the formation of $\alpha\beta\gamma$-trimethylglutaconic acid involves the displacement of the hydrogen atom of the complex X·CH: by sodium, because the course of the reaction can now be represented in the following way:

$$CO_2Et\cdot C(CN){:}CMe\cdot CHK\cdot CO_2Et \longrightarrow CO_2Et\cdot C(CN){:}CMe\cdot CHMe\cdot CO_2Et$$
$$\longrightarrow CO_2Et\cdot CNa(CN)\cdot CMe{:}CMe\cdot CO_2Et$$
$$\longrightarrow CO_2Et\cdot CMe(CN)\cdot CMe{:}CMe\cdot CO_2Et$$

That is to say, the introduction of the sodium atom in the second operation, involving as it does the displacement of the mobile hydrogen atom, causes the metal to take up the most negative position in the system (compare *Trans.*, 1912, **101**, 249).

The following experimental corrections are therefore necessary:

Trans., 1905, **87**, 1694, *line* 21 *from top:* The formula of the potassium compound should be $CO_2Et\cdot C(CN){:}CMe\cdot CHK\cdot CO_2Et$.

Ibid., 1695, *line* 4 *from top:* The name of the ester should be ethyl γ-cyano-$\alpha\beta$-dimethylglutaconate, and the formula

$$CO_2Et\cdot C(CN){:}CMe\cdot CHMe\cdot CO_2Et$$

or $CO_2Et\cdot C(CN)\cdot CMe(H)\cdot CMe\cdot CO_2Et$.

Ibid., 1708, *line* 18 *from top:* The name of the ester should be ethyl γ-cyano-β-methyl-α-ethylglutaconate, and the formula

$$CO_2Et\cdot C(CN):CMe\cdot CHEt\cdot CO_2Et$$

or $CO_2Et\cdot C(CN)\cdot CMe(H)\cdot CEt\cdot CO_2Et$.

47. "The catalytic action of copper at 300° on some alcohols of the terpene group." By George Ballingall Neave.

The Sabatier-Senderens test for distinguishing between primary, secondary, and tertiary alcohols (*Bull. Soc. chim.*, 1905, [iii], **33**, 263) has been extended to some alcohols of the terpene group. *l*-Borneol was converted into *l*-camphor, fenchyl alcohol into fenchone, and menthol into menthone, all three behaving as secondary alcohols. The following, which are regarded as tertiary alcohols, yielded unsaturated hydrocarbons: terpineol and terpin gave dipentene; *iso*borneol gave camphene. Sobrerol, which contains both a secondary and a tertiary alcoholic group, was converted into pinol.

48. "Preparation of the nitrites of the primary, secondary, and tertiary amines. Part II." By Pañchānan Neogi.

Coniinium nitrite has been isolated, in fairly good yield, from a mixture of the hydrochloride of the base and the alkali nitrites.

49. "Trialkylammonium nitrites and nitrites of the bases of the pyridine and quinoline series. Part III." By Pañchānan Neogi.

Coniinium nitrite, colourless fibrous crystals, sublimes unchanged when heated in a vacuum, and then decomposes with the formation of nitrosoconiine. *Coniine methonitrite* forms a viscous, reddish-yellow liquid. *Piperidine ethonitrite* crystallises in colourless plates. *Pyridine ethonitrite* is a colourless liquid.

50. "The glucoside and oil of Caesalpina bonducella." By Kshitibhushan Bhaduri.

The seeds of *Caesalpina bonducella* yield an alkaloid, for which the author suggests the name *natin*. The oil has D^{27} 0·9132, iodine value 96·1, and saponification value 292·8.

51. "Constituents of Vernonia anthelmintica. Part I." By Kshitibhushan Bhaduri.

The seeds of *Vernonia anthelmintica* contain a glucoside, to which the name *shomerajin* is assigned. The oil has D^{25} 0·9731, iodine value 91·7, and saponification value 305·7.

52. "Substituted *iso*thiohydantoins." By Augustus Edward Dixon and John Taylor.

Substituted thioureas (or thiocarbamides), including one, or two, hydrocarbon radicles, when treated with ethyl chloroacetate, produce the corresponding *iso*thiohydantoins. If, however, the thiourea contains an acyl substituent, interaction does not occur.

On the other hand, chloroacetyl chloride readily attacks thioureas containing an acyl radicle, but not with elimination of two hydrogen atoms; instead, the acyl radicle is expelled (yielding an acid chloride), and the residue, joining with the glycolyl group, forms a non-acylated *iso*thiohydantoin; thus, for example:

$$PhN{:}C\begin{<}NHAc\\SH\end{<} + ClCH_2{\cdot}COCl = AcCl + PhN{:}C\begin{<}NH{\cdot}CO\\S\!-\!CH_2\end{<} + HCl.$$

A trisubstituted thiourea, including purely hydrocarbon radicles, X, Y, Z, unites directly with chloroacetyl chloride. In this case, the linking, $\cdot S{\cdot}CH_2{\cdot}CO\cdot$, characteristic of the *iso*thiohydantoins, is not produced, but $\cdot S{\cdot}CO{\cdot}CH_2$ instead, the resultant compound behaving as the hydrochloride of a base, $XYN{\cdot}C(NZ){\cdot}S{\cdot}CO{\cdot}CH_2Cl$.

N-Diphenylisothiohydantoin, $Ph_2N{\cdot}C\begin{<}N{\cdot}CO\\S\!-\!CH_2\end{<}$, is formed when chloroacetyl chloride acts on *n*-benzoyl-*ν*-diphenylthiourea, *n*-acetyl-*ν*-diphenylthiourea, or *ν*-diphenylthiourea; it crystallises from alcohol in brilliant, white prisms, melting at 198° (corr.).

The phenyl*iso*thiohydantoin obtained from *aa*-acetylphenylthiocarbamide and chloroacetyl chloride is the same as that from the *ab*-isomeride; this is attributed to a preliminary transformation of the former variety into the latter during the course of the interaction.

53. "The conversion of *d*-glucosamine into *d*-glucose." (Preliminary note.) By James Colquhoun Irvine and Alexander Hynd.

The scheme suggested in a previous paper (*Trans.*, 1911, **99**, 250) for the conversion of *d*-glucosamine into *d*-glucose has now been successfully completed, and, pending publication of the detailed results, the authors consider it advisable to outline the reactions in a preliminary note, in view of the fact that other workers have been engaged on the same subject (*J. Amer. Chem. Soc.*, 1911, **33**, 766).

Glucosamine hydrochloride has been converted, as already described (*loc. cit.*), into methylglucosamine hydrochloride. As this compound is here shown to be definitely related to glucose it may now be termed *aminomethylglucoside hydrochloride*. Like other

derivatives of glucosamine, it reacts abnormally with nitrous acid, and although ammonia is evolved when the compound is heated with alkali hydroxides, the reaction seems to be complex, and does not yield methylglucoside. Recourse was therefore had to the silver oxide method of methylation which resulted in the formation of a *methyl aminomethylglucoside* (m. p. 89—90°; $[\alpha]_D^{20}$ −14·9° in methyl alcohol) as the first definite product. Further methylation gave *dimethyl aminomethylglucoside* as a colourless syrup, from which the substituted amino-group was expelled by heating with barium hydroxide. The product, on exhaustive methylation, was converted into tetramethyl methylglucoside, which was identified by analysis, boiling point, and specific rotation.

The removal of the methyl groups was effected in two stages. On hydrolysis with dilute acid, tetramethyl glucose was obtained, and its identity confirmed by analysis, melting point (85—86°), and by the specific rotation in water ($[\alpha]_D$ +82·1°). To complete the series of reactions, the alkylated sugar was reduced to the parent hexose by heating with a 40 per cent. solution of hydrogen iodide at 94°. *d*-Glucose, showing the permanent specific rotation $[\alpha]_D^{20}$ +52·4°, was thus obtained in good yield.

The conversion of glucosamine into glucose is thus possible through the following reactions:

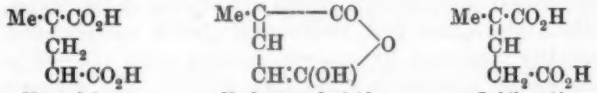
d-Glucosamine hydrochloride → bromotriacetylglucosamine hydrobromide → triacetyl aminomethylglucoside hydrobromide → aminomethylglucoside hydrochloride → methyl aminomethylglucoside → dimethyl aminomethylglucoside → tetramethyl methylglucoside → tetramethyl glucose → *d*-glucose.

In the course of the work, the salts of aminomethylglucoside were re-examined so as to secure accurate comparison with those described by Fischer (*Ber.*, 1911, **44**, 132). The specific rotations for the hydrochloride and hydrobromide in aqueous solution are now found to be −24·22° and −20·23° respectively, and are thus identical with those found by Fischer. The decomposition points are, however, 190° and 181°, values which are uniformly 25° lower than those quoted by Fischer. It seems possible that in Fischer's aminomethylglucoside the amino-group is attached to the carbon atom in either the β- or ε-position to the glucosidic group. This assumption would explain the isomerism of the aminomethylglucosides, and is also in agreement with the production from triacetyl bromomethylglucoside of an anhydroglucose capable of forming anhydrophenylglucosazone (Fischer, *Ber.*, 1912, **45**, 456).

The examination of aminoglucosides prepared from glucosamine is being continued.

54. "The chemistry of the glutaconic acids. Part IV. The structure of the glutaconic acids." By Jocelyn Field Thorpe.

The experimental evidence recorded in the previous parts of this series was reviewed, and the conclusion was drawn that the stable forms of the derivatives of glutaconic acid have a structure similar to that of glutaconic acid itself, in which the tautomeric hydrogen atom is within the three-carbon system and static on the β-carbon atom of this system. The labile acids are those first formed by the hydration of the hydroxyanhydrides, and are in reality the γ-alkyl derivatives of glutaconic acid. The two forms of α-methylglutaconic acid may therefore be represented in this way:



Normal form. Hydroxy-anhydride. Labile acid.

The initial momentum acquired by the hydrogen atom at the moment of its introduction by the hydration of the hydroxy-anhydride carries it, if unchecked, into the three-carbon system; if, however, this "spring" is restrained by alkali or casein, the hydrogen is brought to rest within the carbonyl system.

It was also shown that the esters of the glutaconic acids may be of four distinct types, which may be either tautomeric, desmotropic, or structurally different. Examples of all four types have been isolated and identified.

55. "Epicamphor (β-camphor)." (Preliminary note.) By Julius Bredt and William Henry Perkin, jun.

Epicamphor (I), the isomeride the ordinary camphor (II), has

(I.) (II.)

been obtained by two processes, namely, (i) in small quantities, from camphanecarboxylic acid by bromination, hydrolysis, and subsequent oxidation of the resulting crude hydroxycamphanecarboxylic acid (Lankshear and Perkin, *Proc.*, 1911, **27**, 166), and (ii) from bornylenecarboxylic acid by conversion into the azide, and then into aminobornylene, which, on hydrolysis with hydrochloric acid, yields epicamphor in a yield of 80 per cent. of that theoretically possible (Bredt and Hilbing, *Chem. Zeit.*, 1911, **35**, 765). A new and convenient process for the preparation of epicamphor has now been worked out, and is briefly as follows:

Methyl bornylenecarboxylate is converted by the action of hydroxylamine hydrochloride and sodium methoxide into *bornylene-hydroxamic acid*, $C_{10}H_{15}\cdot C(OH){:}N\cdot OH$, which melts at 136°, and yields an acetyl derivative melting at 112°. When this hydroxamic acid is heated, it undergoes a remarkable decomposition, yielding epicamphor and ammonia, and the sodium salt of the hydroxamic acid is decomposed by toluene-*p*-sulphonyl chloride with the formation of a syrupy substance, from which epicamphor may be obtained in a yield of 60 per cent. of that theoretically possible by treatment with hydrochloric acid and distillation in a current of steam.

Epicamphor melts at 184—185°, and is lævorotatory, having $[\alpha]_D$ −58·24°; it yields an oxime (m. p. 103°) and a semicarbazone (m. p. 238°).

Bromoepicamphor, $C_{10}H_{15}OBr$, obtained by heating epicamphor with bromine in 100°, melts at 134°, and has $[\alpha]_D$ −69·3°.

Epiborneol, $C_{10}H_{17}\cdot OH$, is produced when epicamphor is reduced with sodium and alcohol; it melts at 182—183°, and yields a urethane melting at 82°; it is perhaps a mixture of epiborneol and epi*iso*borneol.

When epicamphor is treated with sodamide and *iso*amyl nitrite, it is converted into a mixture of two *iso*nitroso-derivatives, $C_{10}H_{14}O{:}N\cdot OH$, which may be separated by crystallisation from light petroleum. The more sparingly soluble *α-iso*nitroso-epicamphor melts at 170°, and has $[\alpha]_D$ −201·9; *β-iso*nitroso-epicamphor melts at 140°, and has $[\alpha]_D$ −184·3°, and when it is heated above its melting point it is converted into the *α*-isomeride. Both the *α*- and *β*-isomerides yield camphorquinone on treatment with formaldehyde and hydrochloric acid, and are converted by concentrated sulphuric acid into the imide of camphoric acid (m. p. 244°).

Aminoepicamphor, $C_{10}H_{15}O\cdot NH_2$, is readily obtained when *β-iso*nitrosoepicamphor is reduced in alkaline solution by zinc dust. It separates from light petroleum as a satiny, crystalline mass, melts at 168—170°, and has approximately $[\alpha]_D$ +30·15°. Experiments on the reduction of *α-iso*nitrosoepicamphor are in progress.

Epicamphorcarboxylic acid, $C_{10}H_{15}O\cdot CO_2H$, is produced when sodium or sodamide acts on epicamphor in the presence of carbon dioxide. It melts at 122°, gives a green coloration when ferric chloride is added to its alcoholic solution, and is decomposed, on heating, into epicamphor and carbon dioxide.

Bromoepicamphorcarboxylic acid melts at 148—150°, and is decomposed at this temperature with the formation of the same bromoepicamphor (m. p. 134°) as is obtained by the direct bromination of epicamphor (see above).

The investigation of epicamphor is being continued in various directions.

ADDITIONS TO THE LIBRARY.

I. *Donations.*

Abderhalden, *Emil.* [Editor.] Handbuch der biochemischen Arbeitsmethoden. Vol. V. ii. Wien 1912. M. 34—. (*Reference.*)
From the Publishers: Messrs. Urban & Schwarzenberg.

Bigelow, *S. Lawrence.* Theoretical and physical chemistry. New York 1912. pp. xiii + 544. ill. $3 net. (*Recd.* 19/2/12.)
From the Author.

The Chemical World. A monthly journal of chemistry and chemical engineering. Vol. I, No. I, etc. London 1912. ill. Annual subscription 6/-, post free. (*Reference.*)
From the Publishers: Messrs. J. & A. Churchill.

Dyson, *S. S.*, and **Clarkson,** *S. S.* Chemical works. Their design, erection, and equipment. London 1912. pp. xii + 207. ill. 21/- net. (*Recd.* 2/3/12.)
From the Publishers: Messrs. Scott, Greenwood & Son.

Institute of Chemistry of Great Britain and Ireland. A list of official chemical appointments compiled, . . . by *Richard B.* **Pilcher,** 4th edition. London 1912. pp. 246. 2/- net. (*Recd.* 22/2/12.)
From the Institute.

MacDonald, *George William.* Historical papers on modern explosives. With an introduction by *Sir Andrew* **Noble.** London 1912. pp. xi + 192. 7/6 net. (*Recd.* 20/2/12.) From the Author.

MacEwan, *Peter.* Pharmaceutical Formulas . . . collected chiefly from *The Chemist and Druggist* and *The Chemists' and Druggists' Diaries.* 8th edition. London 1911. pp. xvi + 1040. 10/-. (*Recd.* 17/2/12.) From the Author.

Nisbet, *Harry.* Theory of sizing. Manchester 1912. pp. xi + 75. ill. 2/6 net. (*Recd.* 10/2/12.)
From the Publishers: Messrs. Emmott & Co., Ltd.

II. *By Purchase.*

Beckurts, *H.*, and **Lüning,** *O.* Die Methoden der Massanalyse. Part II. Braunschweig 1912. pp. ix + 483 to 842. ill. M. 10.— (*Recd.* 22/2/12.)

Treadwell, *Frederick Pearson.* Analytical chemistry. Volume I. Qualitative analysis. Authorised translation from the German by *William T.* **Hall.** 2nd edition. New York 1911. pp. xi + 469. ill. 17/- net. (*Recd.* 23/2/12.)

ANNUAL GENERAL MEETING.

The Annual General Meeting will be held on Thursday, March 28th, 1912, at 4.30 p.m., when the President will deliver his address, entitled, "Some Stereochemical Problems."

VAN'T HOFF MEMORIAL.

Subscriptions to the Van't Hoff Memorial Fund should be sent to the Treasurer of the Society (Dr. Alexander Scott, F.R.S.). The sum already promised and received amounts to £44 14*s.* 0*d.*

The next Ordinary Scientific Meeting of the Society will be held on **Thursday, March 21st, 1912, at 8.30 p.m.**, when the following papers will be communicated:

"*iso*Erucic acid." By A. K. Macbeth and A. W. Stewart.

"Parahydroxystilbene and its derivatives." By J. T. Hewitt, W. Lewcock, and F. G. Pope.

"The chemistry of the glutaconic acids. Part V. The esters of substituted glutaconic acids." By N. Bland and J. F. Thorpe.

"Syntheses of 3-hydroxy-(1)-thionaphthen." By A. M. Hutchison and S. Smiles.

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[*Issued* 30/3/12

PROCEEDINGS

OF THE

CHEMICAL SOCIETY.

Vol. 28. No. 399.

Thursday, March 21st, 1912, at 8.30 p.m., Professor PERCY F. FRANKLAND, LL.D., F.R.S., President, in the Chair.

Mr. W. J. S. Naunton was formally admitted a Fellow of the Society.

Certificates were read for the first time in favour of Messrs.:

Arthur Anderson Bones, 640, Schoeman Street, Pretoria, S. Africa.
Raymond Edwin Crowther, Edenvale, Wigton Road, Carlisle.
William Dallas, Burnbank Cottage, Mount Vernon, Glasgow.
Archibald Knox, 18, Newhall Terrace, Greenhead, Glasgow.
Edwin Charles Lacey, B.Sc., St. Julian's Lodge, West Norwood, S.E.
Leslie Herbert Lampitt, M.Sc., Bowyer Road, Saltley, Birmingham.
Robert John Milbourne, Muxton Lodge, Newport, Salop.
George Walker, Stonehurst, Lancaster Road, Morecambe.
Charles Reginald Wilkins, B.Sc., 40, Church Lane, Hornsey, N.

A certificate has been authorised by the Council for presentation to ballot under Bye-law I (3) in favour of Mr. John Scott Thomson, Crawford Street, Dunedin, N.Z.

Of the following papers, those marked * were read:

***56. "Syntheses of 3-oxy-(1)-thionaphthen."**
By Archibald Moritz Hutchison and Samuel Smiles.

It was shown that in the presence of concentrated sulphuric acid and chlorosulphonic acid or other similar reagents, *o*-thiol- and *o*-dithio-benzoic acids with malonic acid or ethylacetoacetate yield 3-oxy-(1)-thionaphthen or derivatives thereof. Reasons were given for considering that this reaction is caused by the condensation of the sulphoxylic acid (*Trans.*, 1911, **99**, 640) with these methylene derivatives:

$$C_6H_4\langle\begin{matrix}CO_2H\\S\cdot OH\end{matrix} + CH_2R_2 = 2H_2O + C_6H_4\langle\begin{matrix}CO\\S\end{matrix}\rangle C{:}R_2.$$

It was also pointed out that other examples of this type of interaction are to be found in technical processes for preparing "thioindigo."

***57. "The behaviour of metallic alloys when heated in a vacuum."**
By Clarence Richard Groves and Thomas Turner.

The authors have heated a number of binary alloys in a porcelain boat under a pressure not exceeding 1 mm. of mercury. The boat was contained in a porcelain tube, and heated in an electric resistance furnace to temperatures ranging from 500° to 1200°.

It is concluded that the alloys may be divided into five groups as follows:

(1) *The metals are not appreciably volatile when heated in a vacuum for a moderate time at or below* 1200°.

As examples of this class may be mentioned the alloys of copper with iron, aluminium, tin, or nickel. It may also be assumed that any mixtures of these four metals in any proportions would also be non-volatile.

(2) *The constituent metals are quantitatively separable.*

Thus the alloys of the copper–bismuth, copper–lead, and copper–zinc series all separate at the melting point of copper. The bismuth, lead, or zinc volatilise, whilst pure copper remains. Iron–zinc alloys can be quantitatively separated at 500°.

(3) *Any excess of the more volatile metal is removed, and a chemical compound remains.*

The gold–zinc series yields AuZn; the copper–antimony, Cu_3Sb; the gold–cadmium, AuCd; and the magnesium–zinc, $MgZn_2$.

(4) *The excess of the more volatile metal is removed, but the residue is not a chemical compound.*

Thus in the copper–arsenic series the arsenic retained diminishes as the temperature rises. At 1200° the composition remains constant with about 20 per cent. of arsenic, which does not correspond with any simple atomic proportions.

(5) *Two (or more) metals may volatilise together.*

Thus lead and zinc tend to pass over together. In the iron–zinc series also there is an increasing proportion of the iron carried over as the temperature rises from 500°. In the silver–zinc series, although separation is nearly quantitative at 700°, there is an increased loss of silver with higher temperatures.

Discussion.

Dr. Hodgkinson inquired if the authors had observed any gas evolution during the process, although he doubted whether that would have been possible owing to the character of the vacuum which had to be maintained against a sealing-wax closure.

His reason for asking was that recently he had melted some very pure electrolytic copper in a silica tube in a Sprengel vacuum, and the evolution of hydrogen had not ceased when the tube cracked after more than twelve hours' heating. The globule of copper was found to be full of large bubbles when cut open after cooling.

The total separation of zinc from copper in brass at 1100° in a vacuum appeared very extraordinary, as some eight or nine years ago he, with Major Howarth, R.A., had made brass of the composition Cu_2Zn by passing zinc vapour, with the aid of a stream of hydrogen, over copper heated to a little over 1000°.

Other metals, such as platinum, nickel, and palladium, also retained definite amounts of zinc in similar circumstances.

Dr. J. F. Spencer pointed out that Professor Turner's experiments indicated that alloys could be divided into pairs, depending on their behaviour on distillation, which were analogous to the various pairs of completely miscible liquids; thus, for example, with some of the alloys a complete separation was possible, whilst with others one metal distilled away, leaving apparently a definite compound. This supposed compound corresponded exactly with the constant-boiling liquid mixture of minimum vapour pressure. Dr. Spencer asked the author if he had made any experiments to see if the composition of the supposed compound was changed in any way, for example, by change in the pressure under which the distillation was carried out.

Mr. Egerton drew attention to the construction of the electric resistance furnaces used by Professor Guntz in his work on the

preparation and distillation of metallic barium, and asked Professor Turner whether he had had trouble with the platinum at high temperatures. Another point which had interested him was the mention of the vapour pressure of metals at the ordinary temperature; it was questionable whether a crystalline metal had any vapour pressure below a certain temperature.

Mr. W. P. Dreaper suggested that the results should be extended to 1300°, so that they could be compared with those recently obtained by Sir W. Crookes, where even iridium lost 7 per cent. of its weight on heating for twenty-two hours. If the iron-copper alloys were stable at that temperature, it would be an interesting fact.

Professor Turner said, in reply to Dr. Hodgkinson, that their experiments showed that the quantity of gas evolved with the relatively small quantities of alloys employed was usually small. When any considerable quantity of gas was evolved, they found that some was occluded in the tube, but practically the whole of this was evolved if the tube were cooled and re-heated. With a second cooling and re-heating, the residue of gas was very small indeed. Porcelain tubes were less permeable to gases at high temperatures than fused silica tubes. It was possible to make brass by heating bright copper in an exhausted glass tube containing zinc at a temperature 50° below the melting point of zinc, or, say, 375°. The platinum in the resistance furnace was in the form of a spiral of thin sheet. It lasted well so long as the temperature did not exceed 1200°, but deteriorated rather rapidly with greater heat. No doubt if some of the alloys examined had been subjected to a higher temperature, different and very interesting results might have been obtained. He hoped someone would carry out such experiments. The separation of metals in a vacuum was usually effected at the melting point of the less fusible metal, but in some cases, as in the zinc–iron series, the alloy was solid throughout the experiment. They had tried various substances for making the joints at the cold ends of the porcelain tube, and had found ordinary red sealing-wax gave the most satisfactory results.

***58. "The oxidation of atmospheric nitrogen in presence of ozone." By Thomas Martin Lowry.**

When air under the ordinary pressure is driven over a series of spark-gaps a product is obtained which gives an increased yield of nitrogen peroxide if mixed with ozone. It is suggested that this product may contain a chemically active form of nitrogen.

Discussion.

Dr. Feilmann remarked that it would be comparatively easy to test Dr. Lowry's hypothesis on the formation of active nitrogen by passing pure nitrogen, free from oxygen, over a spark-gap, and then mixing it with ozonised air.

Dr. Robertson stated that in extending the spectroscopic method for the quantitative estimation of nitrogen peroxide to mixtures containing that gas in very low concentrations, he had found it advisable to make the parts of the apparatus of non-reactive substances; thus for strict quantitative work, observation tubes should be made of silica rather than of glass.

*59. "A method of producing a steady thallium flame." By Thomas Martin Lowry.

Thallium chloride is vaporised by heating it gently in a silica bulb, and is carried into the flame by a current of oxygen. The oxygen is admitted to the bulb by a horizontal tube, and passes into the flame through a second tube, which terminates in a vertical jet.

*60. "Electro-reduction of alkylnitrosoamides." By Hilmar Johannes Backer.

In continuation of previous researches on the electro-reduction of nitroamino-compounds to hydrazines (*Diss.*, Leyden, 1911), the author has studied the reduction of alkylnitrosoamides of common organic acids, which has been unsuccessfully attempted by various investigators.

It was shown that *oxalylbismethylnitrosoamide* (m. p. 66°, decomp.) and *succinylbismethylnitrosoamide* (m. p. 110°, decomp.), when reduced in slightly acid solution with a tinned cathode, yield the corresponding hydrazides, which may be isolated as benzylidene derivatives.

The above-mentioned nitrosoamides, especially that of oxalic acid, are unstable. Their decomposition by alkalis and organic bases was described; in each case diazomethane is formed.

*61. "A model of an asymmetric carbon atom." By William Edward Garner.

The author has constructed a model to illustrate the explanation, proposed by Werner ("Lehrbuch der Stereochemie," 1904, 49), of the racemisation of optically active compounds.

The asymmetric carbon atom is represented by a cube, which

is composed of four wooden blocks ($\frac{3}{4}'' \times \frac{3}{4}'' \times 1\frac{3}{4}''$). The blocks are placed vertically, and bolted in a horizontal direction, leaving a space of $\frac{1}{4}''$ between the blocks (Fig. 1). The bolts are placed as near the centre of the model as possible. Fig. 3 gives a cross-section, showing the manner in which the bolts are employed. Four iron rods are attached to the bolts in such a way that they can

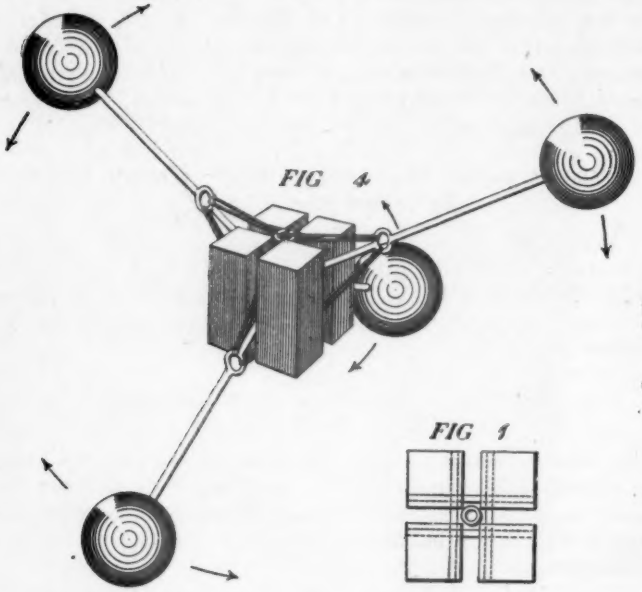


FIG 4

FIG 1

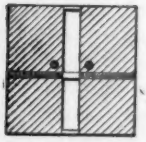


FIG 3

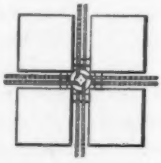


FIG 2

move freely in a vertical direction. Each rod is connected to the two adjacent rods by thin cord, which passes through rings at the top and the bottom of the cube. The method by which this is accomplished may be seen by reference to the diagram (Fig. 2). This represents the top of the cube, but the arrangement of the cords which pass through the lower ring is similar to this if the model be viewed from underneath.

With such a method of attachment, when one arm is vibrated in a vertical direction, all the others move in unison. If one is moved in an upwards direction, then the two adjacent rods will move downwards, whilst that in the opposite position will move upwards (Fig. 4).

Differently coloured balls are attached to the arms, and a model of the asymmetric carbon atom is obtained. If the balls are placed in the order shown in the diagram (Fig. 4), then the arrangement is that of an optically active compound, and if they occupy the vertices of a tetrahedron, the model now illustrates the van't Hoff conception of the asymmetric molecule.

The views of Werner may be illustrated by moving one of the balls up and down, thus causing the other balls to vibrate. This is taken to be the normal condition of the molecule. The application of some external strain, for example, application of heat, causes an increase in the amplitude of the vibration of the groups until all lie in one plane for a small interval of time. This arrangement of the balls is not asymmetric, since a plane of symmetry can be drawn through the carbon atom. Once the balls are in this position there is an equal chance of their returning into their old arrangement or of passing into a new arrangement, which is the mirror image of the first; thus a ball, moving downwards, may continue its movement through the plane of racemisation, and vibrate about a new mean position. This change is similar to that which occurs in the so-called Walden inversion of optically active compounds. Since the new form so produced is transformed with the same facility into the old form, the model gives a method of illustrating Werner's view of racemisation.

The difficulty with which cyclic compounds racemise may be illustrated by tying two opposite arms together, and readjusting the lengths of the strings which control the movement of the arms. It is difficult to bring the other two arms into the plane containing the asymmetric carbon atom, since one of the balls must occupy a position within the ring. For a new arrangement to be formed this ball must pass through the ring, and this is presumably impossible if the group contains several atoms; thus the racemisation of a cyclic compound is practically impossible, unless it can take place through the formation of an intermediate compound.

Whilst the model does not explain the Walden inversion, it is useful in dealing with this process. In the model, only the simplest case can be represented, namely, that in which the amplitude of the vibration of all groups is the same, but this will not interfere with its use for purposes of demonstration.

Another application of the model is to illustrate a possible

explanation of the effect of the solvent on the rotation of an optically active compound. The diminution of the rotation is thus represented by moving the arms nearer to the plane of racemisation, and imparting a motion to them in this new mean position. The model may be used similarly to demonstrate in accordance with the above theory the changes in the rotation of an active compound with temperature.

The readjustment of the strings connecting the arms will serve as a means of altering the valency directions, and so illustrate what may take place when one group is substituted by another. This will alter the direction of the plane of racemisation.

The conversion of fumaric acid into maleic acid may be illustrated by employing two models, in which two adjacent bonds of each are united by short pieces of india-rubber tubing. The groups are then arranged so that the combined model represents either maleic or fumaric acid. If the groups attached to each carbon atom be made to vibrate with the same amplitude, the particular form will be retained; but if the groups attached to one carbon atom be made to pass the plane of racemisation, then the other form is produced.

***62. "Organic derivatives of arsenic and antimony." (Preliminary note.) By Gilbert T. Morgan and Frances M. G. Micklethwait.**

The Grignard reaction carried out with benzyl chloride and antimony trichloride leads to the production of *tribenzylstibine dichloride* (m. p. 105—108°), lustrous crystals, from alcohol; this is hydrolysed to *tribenzylstibine oxide*, which decomposes indefinitely at 240°. Other products of this condensation are being examined.

Comparative experiments with arsenic trichloride and benzyl chloride have shown that the Grignard condensation leads to derivatives of quinquevalent arsenic, from which tribenzylarsine oxide has been obtained.

Antimony trichloride has also been condensed under Grignard conditions with *m*-bromotoluene, *p*-dibromobenzene, *p*-iodonitrobenzene, 4-iodo-1:3-dinitrobenzene, and the three isomeric iodoanilines.

These experiments are being continued with the object of preparing asymmetric organic derivatives of arsenic and antimony suitable for resolution into their optically active components.

63. "*iso*Erucic acid."
By Alexander Killen Macbeth and Alfred Walter Stewart.

In the course of some investigations of absorption spectra, the authors had occasion to purify brassidic acid, two specimens of which were obtained from Schuchardt. This acid was recrystallised

about fifteen times from alcohol, and had a sharp melting point (60°), which remained unchanged by the repeated recrystallisations. On boiling it finally with animal charcoal, the melting point was found to fall to 57—57·2°, and remained constant at this after further recrystallisations. The absorption spectrum of the substance was examined, and found to show slightly less general absorption than either erucic or brassidic acid. Similar results are obtained if crude brassidic is used instead of the purified sample.

An examination of the substance shows that it is unsaturated, as it is easily brominated in aqueous suspension, yielding a bromine derivative (m. p. 46—46·6°). This substance appears to be the dibromide of *iso*erucic acid (m. p. 42—43°), for the dibromide of brassidic acid melts at 54°. *iso*Erucic acid itself is stated to melt at 54—56°, so that it appears probable that the substance obtained as described above is *iso*erucic acid in a purer form than has hitherto been produced.

The suggestion has been put forward in the case of oleic acid that the existence of the third isomeride is to be explained by assuming that in *iso*-oleic acid the double bond has been shifted into the α-position with regard to the carboxyl group. If the same idea is applied to *iso*erucic acid, we should expect to find its absorptive power to be greater than either that of brassidic or erucic acids, owing to the presence of a pair of conjugated double bonds in the molecule; but since it has actually less absorption than either of the other isomerides, this explanation of the isomerism cannot be applied to the present case.

It is proposed to examine other cases of the kind with the view of determining whether the method is generally applicable to the preparation of these *iso*-forms.

64. "*p*-Hydroxystilbene and its derivatives."

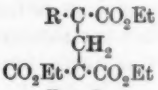
By John Theodore Hewitt, William Lewcock, and Frank George Pope.

The analogy existing between derivatives of azobenzene, benzylideneaniline, and stilbene has been extended by the preparation of 4-hydroxystilbene and its 4′-nitro-derivative, and comparison of their absorption spectra in neutral and alkaline solution with those of stilbene and 4-nitrostilbene. The corresponding methoxy-compounds have also been examined.

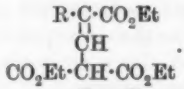
4-Hydroxystilbene is colourless, but shows a strong absorption band in the ultra-violet; a band which is partly in the visible region of the spectrum is shown by the 4′-nitro-derivative. Addition of alkali to the alcoholic solutions of both compounds causes the band to shift towards the red end of the spectrum, but the displacement is considerably greater in the case of nitrohydroxystilbene than in that of hydroxystilbene itself.

65. "The chemistry of the glutaconic acids. Part V. The esters of substituted glutaconic acids." By Norman Bland and Jocelyn Field Thorpe.

It was shown that the esters of substituted glutaconic acids having two negative groups attached to the same carbon atom yield enolic sodium derivatives which dissociate in water to an extent depending on the tendency for the hydrogen atom to pass back into the three-carbon system. The esters formed in this manner are the normal esters of type (I). The undissociated sodium compounds then yield the labile esters (type II) when decomposed by carbon dioxide:

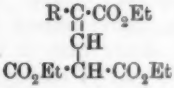


Type I. (Normal ester.)

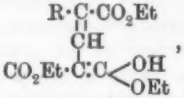


Type II. (Labile ester.)

The esters of type II may exist in either their ketonic or enolic forms:



(Ketonic form.)



(Enolic form.)

and it was shown that the stability of these forms depends on the nature of R.

Thus when R = methyl, the ketonic form is alone capable of existence in the free state; whereas when R = benzyl, an equilibrium mixture of the two desmotropic individuals is produced.

When a methyl group occupies the β-position and a benzyl group the α-position, tautomerism ceases to be apparent, and the ketonic and enolic forms become structurally distinct.

66. "The viscosity of compounds containing tervalent nitrogen. Part I. The amines." By Albert George Mussell, Ferdinand Bernard Thole, and Albert Ernest Dunstan.

Forty-four amines have been examined in the pure state at 25° and 130°, also in amyl acetate and in hydrochloric acid solution. Viscosities have been expressed in terms of the quantity $(\eta + 10^6)/$ Mol. vol. The order of increasing viscosity is tertiary, secondary, primary.

Substitution of an alkyl group for hydrogen lowers the molecular viscosity. Substitution of an acyl, phenyl, or benzyl group for

hydrogen increases the molecular viscosity. Substances with a very high value of K have correspondingly high viscosities.

There is a close parallelism between the association constant x and molecular viscosity. Meta-compounds have, in general, lower viscosities than ortho- or para-derivatives. Conjugation of unsaturated groupings increases viscosity, and acts in a similar way on K.

67. "The reciprocal influence of unsaturated centres and its effect on the general absorptive power of compounds." By Alexander Killen Macbeth, Alfred Walter Stewart, and Robert Wright.

From an examination of the absorption spectra of various stereoisomerides, the authors find that if a molecule contains an unsaturated centre U, such as a carboxyl group, and a saturated centre S, such as an alkyl radicle, a variation in the relative spatial positions of S and U produces very little change in the general absorptive power of the molecule. On the other hand, if the molecule contains two unsaturated centres, a change in their relative spatial positions produces a marked alteration in the absorption spectrum; thus erucic and brassidic acids have very similar absorption spectra, whereas the spectra of maleic and fumaric acid differ very considerably from each other. From this the authors deduce that in order to alter the general absorptive power of a molecule it is necessary to change the relative positions of at least two unsaturated centres within the molecule. The action of two centres of unsaturation is also shown by a comparison of the absorption spectra of ammonium thiocyanate and thiocarbamide. In the former there is only one unsaturated centre, namely, the ·CNS-group; whilst in the latter there are two, namely, the amido-radicles. The latter compound has a much greater absorptive power than the former.

68. "Experiments on a yellow colouring matter from ergot." By Albert Freeborn.

It was shown that the three yellow colouring matters hitherto obtained from ergot (sclerocrystallin, ergochrysin, and secalonic acid) are in all probability identical, and have the composition $C_{21}H_{22}O_9$. Another *substance*, crystallising in pale yellow needles, of the composition $C_{15}H_{14}O_7$, and melting at 338°, has now been obtained. It yields a *tetra-acetyl* derivative, $C_{23}H_{20}O_{10}$, melting at 231°, and does not contain methoxyl. On fusion with potassium hydroxide, an unidentified phenolic acid is formed, probably containing at least three phenolic hydroxyl groups.

69. "The density of acetic acid. A correction."
By William Robert Bousfield and Thomas Martin Lowry.

In the paper on acetic acid (Bousfield and Lowry, *Trans.*, 1911, **99**, 1439) the difference in the density of acetic acid for 1° was given as 0·00123 instead of 0·00113. This does not affect the data given in the paper, but introduces errors of 0·0001 to 0·0003 in the reduction to 18° of the values given by other observers.

ADDITIONS TO THE LIBRARY.

I. *Donations.*

Burgess, *G. K.*, and **Le Chatelier,** *H.* The measurement of high temperatures. 3rd edition. New York 1912. pp. xviii + 510. ill. $4 net. (*Recd.* 15/3/12.)

From the Publishers: Messrs John Wiley & Sons.

Prescriber, The. A monthly journal dealing with therapeutics, pharmacology and the newer remedies. Edited by *Thomas* **Stephenson.** Vols. II.–V. Edinburgh 1908–1911. Annual subscription, 5/-, post free. (*References.*)

II. *By Purchase.*

Cohnheim, *Otto.* Chemie der Eiweisskörper. 3rd edition. Braunschweig 1911. pp. xii + 388. M. 12.— (*Recd.* 14/3/12.)

Fraenkel, *Sigmund.* Die Arzneimittel-Synthese auf Grundlage der Beziehungen zwischen chemischem Aufbau und Wirkung. 3rd edition. Berlin 1912. pp. viii + 823. M. 24.— (*Recd.* 19/3/12.)

Hoff, *J. H. van't.* See **Jorissen,** *W. P.*, and **Reicher,** *L. Th.*

Jorissen, *W. P.*, and **Reicher,** *L. Th.* J. H. van't Hoff's Amsterdamer Periode, 1877–1895. Helder 1912. pp. vi + 106. M. 4·70. (*Recd.* 14/3/12.)

Ostwald, *Wilhelm.* Outlines of general chemistry. Translated by *W. W.* **Taylor.** 3rd edition. London 1912. pp. xvii + 596. 17/- net. (*Recd.* 14/3/12.)

Plotnikow, *Johannes.* Photochemische Versuchstechnik. Leipzig 1912. pp. xv + 371. ill. M. 11.— (*Recd.* 14/3/12.)

Urbain, *G.* Introduction a l'étude de la Spectrochimie. Paris 1911. pp. iii + 248. ill. 8/- net. (*Recd.* 14/3/12.)

VAN'T HOFF MEMORIAL.

Subscriptions to the Van't Hoff Memorial Fund should be sent to the Treasurer of the Society (Dr. Alexander Scott, F.R.S.). The sum already received amounts to £60 1*s.* 0*d.*

OPTICAL CONVENTION.

In connexion with the Optical Convention and Exhibition of Optical and Allied Industries to be held in the latter half of June, 1912, a Committee is to be formed for the purpose of establishing an effective co-operation between scientific men—the users of optical instruments—and British manufacturers of such instruments. Fellows of the Chemical Society who may be willing to assist this Committee by making known their special wants or their suggestions for the improvement in the design and construction of optical instruments and appliances in which they are interested, can obtain forms from the Honorary Secretaries on which to communicate with the Honorary Secretary of the Optical Convention.

EIGHTH INTERNATIONAL CONGRESS OF APPLIED CHEMISTRY.

The Eighth International Congress of Applied Chemistry will be opened by the President of the United States at Washington on September 4th, 1912. Subsequent meetings will be held in New York from September 6th to 13th. During the week, members will be entertained, and, afterwards, visits will be made to factories and other places of interest in the United States and in parts of Canada. The attention of visitors to the Congress is particularly called to the following dates:

May 15th, 1912: All who desire to take part in the Yellowstone Park Tour must have their notification in the hands of the American Committee.

June 1st, 1912: Reservations on the S.S. *Cleveland* and *Philadelphia* remaining unsold at this date to members of the Congress will be disposed of as the Executive Committee may decide.

June 15th, 1912: All persons desiring to take part in any tour apart from the Yellowstone Park Tour must have their notification in the hands of the American Committee.

June 30th, 1912: All papers that authors expect to have printed and distributed at the time of the Congress must be in the hands of the American Committee.

July 15th, 1912: All memberships received after this date by the American Committee are accepted on the condition that delivery of printed reports cannot be *guaranteed* to such members.

Rules, and Announcement No. 3, containing general information, programme, details of excursions, etc., with forms of application for membership, may be obtained from Mr. C. G. Cresswell, Society of Chemical Industry, Palace Chambers, Westminster, S.W. Membership tickets, price £1 each, can be obtained from Dr. M. O. Forster, F.R.S., *Treasurer of the British Organising Committee*, 84, Cornwall Gardens, S.W.

The next Ordinary Scientific Meeting of the Society will be held on **Thursday**, April **18th**, 1912, at **8.30** p.m.

R. CLAY AND SONS, LTD., BRUNSWICK ST., STAMFORD ST., S.E., AND BUNGAY, SUFFOLK.

[*Issued* 29/4/1

PROCEEDINGS

OF THE

CHEMICAL SOCIETY.

Vol. 28. No. 400

Thursday, March 25th, 1912, ANNUAL GENERAL MEETING, Prof. PERCY F. FRANKLAND, LL.D., F.R.S., President, in the Chair.

Professor A. G. GREEN and Dr. G. SENTER were appointed Scrutators, and the ballot was opened for the election of Officers and Council for the ensuing year.

The Report of the Council on the progress of the Society during the past twelve months was presented by the PRESIDENT; and the TREASURER made a statement as to the Society's Income and Expenditure for 1911. After some remarks with reference to the awarding of Grants from the Research Fund of the Society made by Mr. John Hughes, the Adoption of the Report of the Council, together with the Balance Sheet and Statements of Accounts for the year ended December 31st, 1911, proposed by Professor E. J. MILLS and seconded by Dr. A. HARDEN, was carried unanimously.

A Vote of Thanks to the Auditors was proposed by the TREASURER and seconded by Mr. W. MACNAB.

REPORT OF THE COUNCIL.

On the 31st December, 1910, the number of Fellows was 3,073. During 1911, 136 Fellows were elected, and 2 have been reinstated, the gross total being 3,211. The Society has lost 31 Fellows by death; 37 have resigned; the elections of 3 Fellows have become void; 1 Fellow has been elected an Honorary and Foreign Member, and 35 have been removed for non-payment of annual subscriptions.

The total number of Fellows, therefore, on the 31st December, 1911, was 3,104, showing a net increase of 31 over the preceding year. For the past six years the average number of newly-elected Fellows has been 163, whilst the average increase in membership

has been over 60. This year the marked falling off in the number of new Fellows accounts for the small net increase.

The names of the deceased Fellows, with the dates of their election, are:

John Attfield (1862).
Edward Beanes (1864).
Frederic Braby (1869).
Joseph Brown (1882).
Carl von Buch (1877).
Edward Collens (1873).
Albert Cooper (1889).
John Arthur Cunningham (1907).
Stephen Darby (1852).
Richard Hayton Davis (1872).
John Greig Ferrier (1905).
James Forbes (1874).
Albert Harrison (1888).
Alfred Henry Hoit (1904).
William Hudson (1878).
Leonard Parker Kinnicutt (1895).
Frederick Charles Knight (1889).
Isidore Bernadotte Lyon (1873).
William McCowan (1875).
Mervyn Herbert Nevil Story Maskelyne (1851).
John Muter (1870).
Ralph Henry Christopher Nevile (1878).
Temple Augustus Orme (1869).
Lewis Buttle Ross (1870).
Sir Samuel Alexander Sadler (1868).
James Sharp (1885).
Harry Wood Smith (1890).
James Samuel Hourston Walker (1890).
William Whitehouse (1889).
William Williams (1892).
William George Winterson (1908).

The following Fellows have resigned:

Francis Paul Armitage.
William Henry Benson Baker.
George Russell Beardmore.
William Arthur Colebourn.
George Hugh Crisp.
Middleton Henry Dand.
Francis Bridger Dutton.
Walter Nicholas Edwards.
Walter John Elliott.
Bernard Scott Evans.
Joseph Valentine Francies.
John Lawrence van Geyzel.
Archibald Melville Glass.
Herbert Grime.
William Peer Groves.
Archie Cecil Osborn Hann.
Sydney Walters Harris.
John Ansted Harrison.
Arthur Edwin Hill.
Victor George Jackson.
Edwin Charles Jee.
Rudolph Lyon.
William James McKerrow.
Edward Handfield Morton.
Alan Edward Munby.
Cyril Lawrence Norman.
Georges Ponthieu.
Harry James Powell.
James Proude.
James Bertram Russell.
Henry Stanley Shelton.
Charles Joseph Smith.
Brenton Symons.
Harold Munkman Timpany.
Gustave Arthur Troye.
John Watson.
George Edward Welch.

The following Fellow has been elected an Honorary and Foreign Member:

John William Mallet.

The following Fellows have been reinstated by the Council, in accordance with Bye-law IV:

Robert Drysdale MacKechnie.
James Bertram Russell.

The Council will be glad to receive information as to the present address of the following Life Fellows who have not answered the inquiries made in the usual manner: J. Bayne, G. W. Davey, and J. Parkinson.

The question of the misuse of the letters "F.C.S." has again been considered by the Council, and opinion of Counsel has now been received that a person using the letters "F.C.S." without authority and for the purpose of assuming wrongfully the status of a Fellow of the Chemical Society, can be restrained by injunction from so doing.

At the end of 1910 the number of Honorary and Foreign Members was 30. During 1911 the Society has had to mourn the loss of J. H. Van't Hoff, A. Ladenburg, Walthère Spring, and L. J. Troost; whilst on March 2nd E. Bamberger, G. Ciamician, P. H. Ritter von Groth, J. W. Mallet, and W. Nernst were elected. The number of Honorary and Foreign Members at the end of 1911, therefore, was 31.

The Council has great pleasure in offering its hearty congratulations to Mr. Edward Riley, who completed his sixtieth year of Fellowship on December 15th, and to the following, who, during the past year, attained their Jubilee as Fellows:

Major Charles Edward Beadnell, R.A.
Mr. Henry Owen Huskisson.
Mr. Frederick Norrington.

During the year, 342 scientific communications were made to the Society, 265 of which have been published already in the Transactions, and abstracts of all have appeared in the Proceedings.

The volume of Transactions for 1911 contains 2,371 pages, of which 2,270 are occupied by 259 memoirs, the remaining 101 pages being devoted to the Obituary Notices, the Faraday Lecture, the Berthelot Memorial Lecture, the Report of the International Committee on Atomic Weights, the Report of the Annual General Meeting, and the Presidential Address; the volume for the preceding year contains 270 memoirs which occupy 2,601 pages.

The Journal for 1911 contains 5,236 abstracts, which extend to 2,200 pages, whilst the abstracts for 1910 numbered 4,867, and occupied 2,032 pages. The abstracts may be classified as follows:

PART I.

	Pages.	No. of Abstracts.
Organic Chemistry	1,056	1,785

PART II.

General and Physical Chemistry		1,097
Inorganic Chemistry		489
Mineralogical Chemistry		136
Physiological Chemistry		717
Chemistry of Vegetable Physiology and Agriculture		343
Analytical Chemistry		669
	1,144	3,451
Total in Parts I. and II.	2,200	5,236

The attention of Authors is drawn to the notice printed on the cover of the Journal regarding extra copies of papers. This notice now reads:

"7. If Authors require more than the 50 reprints allowed by the "Society, they should inform the Editor at the time they send in "their corrected proofs, when the extra copies will be supplied at "rates which can be obtained from the Printers."

The Transactions for 1911 contain obituary notices of Beilstein, Erlenmeyer, Fittig, Landolt, and Menschutkin, accompanied by a portrait of each of these eminent Honorary and Foreign Members. Obituary notices appear, also, of R. Abegg, J. Campbell Brown, Michael Carteighe, O. Guttmann, Sir Walter Palmer, Bart., and C. H. Greville Williams, and the Council expresses its thanks to those gentlemen who have so kindly prepared these notices.

The Faraday Lecture was delivered in the Lecture Theatre of the Royal Institution (by the courtesy of the Managers) on June 14th, by Professor Theodore W. Richards, who took as the subject of his discourse, "The fundamental properties of the elements." The lecture was published in the Transactions for June, and an account of the speeches made at the close of the lecture will be found in the Proceedings (p. 177 *et seq.*).

On November 23rd the Society had the privilege of listening

to an account of the life and work of Berthelot from Professor Harold B. Dixon.

Sir Oliver Lodge has kindly consented to deliver the Becquerel Memorial Lecture in the place of Professor Rutherford. The Berthelot and Becquerel Lectures, together with those in honour of Moissan and Cannizzaro, may enable the Council to arrange for the publication of a second volume of Memorial Lectures.

The number of Fellows elected during the early years of the Society's existence has been still further diminished by the death of Nevil Story Maskelyne, elected on June 2nd, 1851, Stephen Darby, elected on November 15th, 1852, and John Attfield, elected on January 16th, 1862. The Society was represented by Sir William Tilden and Professor Crossley at the funeral of Dr. Attfield, and by Dr. Hugo Müller at that of Dr. Nevil Story Maskelyne.

The Council has received a portrait of Dr. John Jeffries presented by Mr. G. H. Gabb, and a portrait of Professor Adolf von Baeyer, presented by the Society of Dyers and Colourists. The best thanks of the Council have been accorded for these gifts, and for a generous bequest of a number of chemical works of historical interest, of which the Library contained no copy, from the family of the late Dr. W. J. Russell.

On the occasion of the Coronation of His Majesty King George V. the Council presented a Loyal Address of Congratulation (Proc., p. 184). The Society co-operated with the other Societies in Burlington House in decorating and illuminating the building during the Coronation festivities.

An address was presented to the Royal Academy of Sciences of Turin on the occasion of the Centenary Commemoration of Amedeo Avogadro (Proc., p. 272). The Society has received from the Academy a copy of the Avogadro Medal which has been placed in the cabinet in the Library.

At the celebration of the 500th Anniversary of the Foundation of the University of St. Andrews, the Society entrusted to Sir William Tilden the presentation of an address of congratulation (Proc., p. 185).

Prof. R. Meldola and Sir William Ramsay have been nominated to represent the Society on the Council of the International Coal Smoke Abatement Exhibition to be held in London in April, 1912, and Prof. J. B. Cohen, Prof. H. B. Dixon, and Prof. A. Smithells attended on behalf of the Society the Conference of the Smoke Abatement League of Great Britain, held in Manchester in November.

The Council desires to record its appreciation of the valuable

services rendered to the Society by Professor G. T. Morgan, who, owing to his appointment to the Chair of Chemistry at the Royal College of Science, Dublin, retires from the position of Honorary Secretary, which he has held for two years.

The general invitation to the Society to attend the meetings of the Eighth International Congress of Applied Chemistry to be held in Washington and New York in September, 1912, has been accepted by the Council on behalf of the Society. Further particulars of the Congress will be announced.

The Council considered a suggestion made by Professor Hofmann and Professor Ruff at the request of the German Chemical Society, for the subdivision of the section of Inorganic Chemistry at the Eighth International Congress of Applied Chemistry, and resolved that: "In the opinion of the Council of the Chemical Society, the object of the International Congress of Applied Chemistry is to bring together persons whose interests do not exactly follow the same lines; and they consider that too much subdivision of the various Sections will defeat one of the objects for which the Congress was instituted. The Council, therefore, on general grounds, cannot support the proposal made by Professor Hofmann and Professor Ruff for consideration by the German Chemical Society."

An International Committee has been formed for the purpose of raising a memorial to the late Prof. J. H. van't Hoff, and the Treasurer will be glad to receive donations from Fellows to this fund.

The Longstaff Medal for 1912 has been awarded to Dr. H. Brereton Baker, and the formal presentation of the medal will be made at the Annual General Meeting.

The Council has made a donation of £10 to the International Commission of Publication of Annual Tables of Constants and Numerical Data, Chemical, Physical, and Technological.

During 1911, 1,808 books were borrowed from the Library, as against 1,918 in 1910; of these 419 were issued by post, as compared with 573 in the previous year.

The additions to the Library comprise: 171 books, 104 of which were presented, 438 periodicals (representing 237 Journals), and 87 pamphlets, compared with 163 books, 431 volumes of periodicals (representing 236 Journals), and 141 pamphlets last year.

These figures show a decrease of 110 in the number of books borrowed, and 54 in the number of pamphlets; whilst there is an increase of 8 in the books added, and 7 in the number of periodicals.

With the object of keeping the Library as up-to-date and repre-

sentative as possible, the Council will especially welcome the gifts of works written by Fellows of the Society.

A year ago attention was called to the fact that the expenditure for 1910 had exceeded the income by £147, but that this could be traced to several causes acting simultaneously.

In spite of the notably smaller number of new Fellows elected and the consequent diminution in receipts from admission fees, the income for the year which has closed exceeds the expenditure by £235 17*s.* 8*d.*, which is more than enough to compensate for the adverse balance of the previous year. The income from all sources for 1911 amounts to £7,735 11*s.* 6*d.*, and the total expenditure to £7,499 13*s.* 10*d.*, the corresponding amounts for 1910 being £7,447 5*s.* 10*d.* and £7,594 12*s.* 2*d.* respectively. Whilst the receipts have thus increased by £288 5*s.* 8*d.*, the expenditure has been reduced by £94 18*s.* 4*d.*, and this has been attained without diminishing in any way the activity and efficiency of the Society.

The Journal is a little smaller in bulk, and has cost about £30 less for printing. Our bill for "corrections" (always a very unsatisfactory and debatable item in our printers' accounts) and the average cost per page for this, grows steadily less owing to the strenuous care of the Editor, aided by the cordial co-operation of the great majority of authors with the Publication Committee and compliance with its suggestions. The exercise of greater care in the preparation of manuscript, the adoption of more concise expression, and the elimination of unnecessary experimental details would very considerably reduce the cost of the Journal, with great advantage to author and reader alike. For 1911 the cost of the Journal was £5,237 13*s.* 7*d.*, as against £5,177 7*s.* 8*d.* for 1910, an increase of only £60 5*s.* 11*d.* Of this, £44 10*s.* 0*d.* is due to an increase in the amount of abstractors' fees, an item paid as "piece work," for which the Society most certainly gets its full value, and the Council takes this opportunity of recording its sense of indebtedness to the abstractors for their important services. In almost all other departments economies have been effected as compared with last year; on other publications about £12, the Library £17, miscellaneous expenses, £8, and administrative expenses £118. These decreases amount in all to £180 17*s.* 5*d.*, and the increases to £85 19*s.* 1*d.*, resulting in the net diminution of expenditure stated above.

The increased profit resulting from the management of the advertisements by the Society's officers has fully justified the changes made in this department more than a year ago, since the net gain to the Society from this source is about £110, as against £75 for

INCOME AND EXPENDITURE ACCOUNT

Income.

	£ s. d.	£ s. d.
To Life Compositions		302 0 0
,, Admission Fees		596 0 0
,, Annual Subscriptions—		
Received in advance, on account of 1911	301 0 0	
,, during 1911 ,, 1911	4281 0 0	
,, ,, ,, ,, 1910	374 0 0	
,, ,, ,, ,, 1908–9	7 0 0	
,, ,, ,, Anonymous subscription for 1910	2 0 0	
	4965 0 0	
Less amount included in last year's Income, being valuation of Arrears as per last Balance Sheet	370 0 0	
	4595 0 0	
Add Arrears at date: 1911 £486; 1910 £20; 1909 £6, 1908 £1, estimated to realise as per Balance Sheet	360 0 0	
		4955 0 0
,, Lady Subscribers		4 10 0
,, Investments:—		
Dividends on £6730 Metropolitan Consolidated 3½ per cent. Stock	221 16 4	
,, £1050 London and North Western Railway 3 per cent. Debenture Stock	29 18 2	
,, £1520 14s. 3d. Cardiff Corporation 3 per cent. Stock	42 19 4	
,, £1400 India 2½ per cent. Stock	32 19 4	
,, £2400 Bristol Corporation 2½ per cent. Debenture Stock	56 10 0	
,, £4341 Midland Railway 2½ per cent. Preference Stock	102 3 10	
,, £1200 Leeds Corporation 3 per cent. Stock	33 18 0	
,, £1500 Transvaal 3 per cent. Guaranteed Stock, 1923/53	42 7 6	
,, £1200 North British Railway 3 per cent. Debenture Stock	33 18 0	
,, £700 Canada 3½ per cent. Stock 1930/50	23 1 6	
Income Tax Recovered	30 13 5	
,, Interest on Deposit Account	13 3 1	
		663 3 6
,, Publications:—		
Sales:		
Journals	904 1 11	
Proceedings	30 10 2	
General Index	26 3 0	
Library Catalogue	1 13 3	
Atomic Weight Tables	0 8 3	
Annual Reports on the Progress of Chemistry	152 11 0	
	1115 7 7	
Less Publishers' Commission	106 9 2	
	1008 18 5	
Proceeds of Advertisements in Journal... £184 12 2		
Less Commission 9 16 3	174 15 11	
		1183 14 4
,, Sale of Waste-paper, old Ballot Boxes, etc.		3 7 2
,, Subscriptions from other Societies:—		
Society of Chemical Industry	8 8 0	
Society of Public Analysts	10 10 0	
Optical Society	8 8 0	
Optical Convention	0 10 6	
		27 16 6
		£7735 11 6

I have examined the above Accounts with the Books and Vouchers of the Society, and find the Investments.

28, Queen Victoria Street,
London, E.C.
13th March, 1912

W. B. KEEN,
Chartered Accountant.

FOR THE YEAR ENDED 31ST DECEMBER, 1911.

Expenditure.

	£	s.	d.	£	s.	d.
By Expenses on account of Journal and Proceedings:—						
Salary of Editor, including Indexing	570	0	0			
Salary of Sub-Editor	200	0	0			
Editorial Postages	25	9	9			
Abstractors' Fees	529	15	10			
Printing of Journal	2849	6	0			
Illustrations	9	9	10			
Banding	59	13	11			
Printing of Advertisements	65	13	0			
Wrappers and Addressing	122	6	10			
Distribution of Journal	598	4	0			
Authors' Copies	201	10	2			
Insurance of Stock at Clay's	6	4	3			
				5237	13	7
Printing of Proceedings	219	6	3			
Banding ,,	8	11	7			
Distribution ,,	34	17	6			
				264	15	4
,, Annual Reports on the Progress of Chemistry				416	6	8
,, Purchase of back numbers of Journal				3	4	0
,, List of Fellows				69	10	0
,, Faraday Lecture:—						
Honorarium and Expenses				30	6	6
,, Library Expenses:—						
Salary of Librarian and Assistant	180	16	0			
Books and Periodicals	229	7	1			
Binding	42	3	2			
Bookcases	12	2	0			
				464	8	3
,, Indexing for International Catalogue				30	0	0
,, Coronation Illuminations				10	10	0
,, Portraits of Past Presidents				32	11	0
,, Donation to International Commission for Publication of Physico-Chemical Tables				10	0	0
,, Administrative Expenses:—						
Salary of Assistant Secretary	280	0	0			
Salary of Office Assistant	83	0	4			
Wages (Commissionaire, Housekeeper, and Charwoman)	156	8	0			
Coal and Lighting	37	16	10			
House Expenses and Repairs	86	15	11			
Tea Expenses	28	8	11			
Insurances	11	8	3			
Accountants' Charges	21	0	0			
Commission on Recovery of Income Tax	1	10	8			
Printing	104	3	10			
Stationery	34	10	8			
Illuminated Addresses	8	9	6			
Postages	108	8	9			
Miscellaneous Expenses	18	6	10			
				930	8	6
,, Balance, being excess of Income over Expenditure, carried to Balance Sheet				235	17	8
				£7735	11	6

certify them to be in accordance therewith. I have also verified the Balance at the Bankers

Approved— FREDERICK B. POWER,
JOHN M. THOMSON,
SAMUEL RIDEAL.

BALANCE SHEET.—THE CHEMICAL SOCIETY, 31st December, 1911.

Liabilities.

	£ s. d.	£ s. d.
To Subscriptions received in advance		239 0 0
,, Cash received on Account of Annual Reports, Vol. VIII. (not published)		28 7 7
,, Sundry Creditors		1468 17 0
,, Research Fund :—		
As per last Balance Sheet	10505 1 9	
Less Excess of Expenditure over Income for the year	8 12 8	
		10496 9 1
		12232 13 8
,, Chemical Society : Excess of Assets over Liabilities :—		
As per last Balance Sheet...	20157 10 1	
Add Excess of Income over Expenditure for the year	235 17 8	
		20393 7 9
		£32626 1 5

Assets.

	£ s. d.	£ s. d.
By Investments (value when acquired):—		
£6750 Metropolitan Consolidated 2½ per cent. Stock	7212 8 6	
£1050 London and North Western Railway 3 per cent. Debenture Stock	839 12 0	
£1520 14*s.* 3*d.* Cardiff Corporation 3 per cent. Stock	1650 0 0	
£1400 India 2½ per cent. Stock	1316 1 0	
£2400 Bristol Corporation 2½ per cent. Debenture Stock	2070 2 0	
£4341 Midland Railway 2½ per cent. Preference Stock	3572 2 5	
£1200 Leeds Corporation 3 per cent. Stock	1143 1 0	
£1500 Transvaal 3 per cent. Guaranteed Stock, 1923/53	1460 13 6	
£1200 North British Railway 3 per cent. Debenture-Stock	1033 11 0	
£700 Canada 3½ per cent Stock, 1930/50	704 8 6	
		21601 19 11
(Estimated present value of Investments, £18301 0*s.* 6*d.*)		
,, Sundry Debtors :—		
Optical Society	1 11 6	
Advertising Accounts	66 16 2	
Messrs. Gurney & Jackson	454 18 3	
Telephone Deposit	1 0 0	
		524 5 11
,, Subscriptions in Arrear, £513. Estimated to realise ..		360 0 0
,, Insurances paid in advance		56 11 4
,, Cash at Bank on Deposit Account	250 0 0	
,, Cash in hand	21 1 5	
	271 1 5	
,, *Less* Overdraft on Current Account	84 6 3	
		186 15 2
,, Research Fund :—		
Investments (value when acquired):		
£1000 North British Railway 4 per cent. No. 1 Preference Stock	1010 0 0	
£4400 Metropolitan Consolidated 3½ per cent. Stock	4587 18 0	
£1034 Great Western Railway 2½ per cent. Debenture Stock	1049 15 11	
£1142 16*s.* New South Wales 3 per cent. Stock ...	1000 0 0	
£1122 Metropolitan Water Board 3 per cent. "B" Stock	1002 16 9	
£1365 Midland Railway 2½ per cent. Debenture Stock	1010 0 9	
£806 Victoria 3 per cent. Stock	706 6 2	
	10366 17 7	
(Estimated present value of Research Fund Investments, £9059 12*s.* 8*d.*)		
,, Cash at Bank	129 11 6	
		10496 9 1
		£32626 1 5

£32626 1 5

£32626 1 5

Research Fund Income and Expenditure Account for the Year ended 31st December, 1911

Income.

	£ s. d.	£ s. d.
To Dividends on:—		
£1000 North British Railway 4 per cent. No. 1 Preference Stock	37 13 4	
£4400 Metropolitan Consolidated 3½ per cent. Stock	145 0 4	
£1034 Great Western Railway 2½ per cent. Debenture Stock	24 6 10	
£1142 16s. New South Wales 3 per cent. Stock	32 5 10	
£1122 Metropolitan Water Board 3 per cent. "B" Stock	31 14 0	
£1365 Midland Railway 2½ per cent. Debenture Stock	32 2 8	
£806 Victoria 3 per cent. Stock	22 15 4	
		325 18 4
,, Repayments of Research Grants:—		
A. T. Cameron	5 8 7	
H. McCombie	5 0 0	
F. D. Chattaway	1 2	
A. E. Dunstan	12 2	
F. B. Thole	4 6	
G. Dean	5 5 0	
V. H. Veley	5 8 7	
G. Senter	2 6	
A. Clayton	4 4 7	
W. W. Close	5 0 0	
W. Godden	2 9 7	
A. Lapworth	10 0 0	
		42 16 8
,, Income Tax Recovered		20 3 6
,, Balance, being Excess of Expenditure over Income carried to Balance Sheet		8 12 8
		£398 11 2

Expenditure.

	£ s. d.		£ s. d.
By Grants to—			
E. C. C. Baly	10 0 0	*Brought forward*—199	0 0
T. Q. Chou	8 0 0	A. T. Cameron	5 0 0
C. H. Hampshire	3 0 0	A. Campion	10 0 0
T. P. Hilditch	10 0 0	D. Cardwell	10 0 0
E. Hope	10 0 0	F. W. Caton	5 0 0
T. E. Hull	10 0 0	F. D. Chattaway	10 0 0
T. C. James	5 0 0	A. Clayton	10 0 0
J. Kenner	5 0 0	Miss G. Cliffe	5 0 0
F. R. Lankshear	12 0 0	H. M. Dawson	10 0 0
T. M. Lowry	10 0 0	C. Dorée	5 0 0
J. W. McBain	10 0 0	A. C. Dunningham	7 0 0
J. E. Myers	5 0 0	J. Ferns	10 0 0
W. Parry	10 0 0	R. T. Hardman	10 0 0
R. Robinson	25 0 0	E. Hope	15 0 0
R. E. Slade	5 0 0	A. Hopwood	10 0 0
Miss I. Smedley	8 0 0	T. E. Hull	12 10 0
S. Smith	10 0 0	J. W. McDavid	10 0 0
F. B. Thole	5 0 0	A. N. Meldrum	5 0 0
H. T. Tizard	8 0 0	R. S. Pollard	10 0 0
W. E. S. Turner	8 0 0	J. N. Pring	15 0 0
D. Tyrer	12 0 0	W. M. Roberts	15 0 0
O. L. Brady	10 0 0	D. Segaller	5 0 0
Carried forward—199	0 0		393 10 0
,, Commission on Recovery of Income Tax			1 0 2
,, Advertisements			3 13 0
,, Cheque Book			8 0
			£398 11 2

I have examined the above Account with the Books and Vouchers of the Society, and certify it to be in accordance therewith. I have also verified the Balance at the Bankers and the Investments.

W. B. KEEN,
Chartered Accountant,
23, Queen Victoria Street,
London, E.C

13th March, 1912.

Approved—
FREDERICK B. POWER,
JOHN M. THOMSON,
SAMUEL RIDEAL.

1910, and £10 in 1909. This is largely due to the energy of Mr. Carr, and to the loyal support given by the Fellows of the Society and other advertisers.

The net income from the investments in the name of the Research Fund amounts to £345 1*s.* 8*d.*, and this, together with returned grants to the extent of £43 16*s.* 8*d.*, made the income available for distribution amongst applicants £388 18*s.* 4*d.*, and as there was a balance in hand, the Council was enabled to distribute a sum of £393 10*s.* 0*d.* in forty-two grants, which varied in amount from £3 to £25.

ADDENDUM.

International Association of Chemical Societies.

As mentioned in the Proceedings (p. 132 *et seq.*), meetings of the delegates appointed by the French, English, and German Chemical Societies took place in Paris on the 25th and 26th April last, at which the statutes of the Association were drafted, and subsequently ratified by the Councils of the three Chemical Societies responsible for the foundation of the Association. These statutes are printed in full in the Proceedings. They may, however, be briefly summarised as follows:

The object of the Association is to form a bond of union between the several Chemical Societies of the world for the purpose of taking into consideration such matters as are of general and international interest to Chemistry.

All Chemical Societies are eligible to join the Association. The Association is under the direction of a Council consisting of a certain number of members, and each Country can only be represented on the Council by a single Chemical Society, which shall nominate three representatives.

Thus the Council constituted at the Paris Conference consisted of Profs. Béhal, Haller, and Hanriot (French Chemical Society), Profs. Frankland and Meldola, and Sir Wm. Ramsay (Chemical Society), and Profs. Jacobson, Ostwald, and Wichelhaus (German Chemical Society).

The admission of representatives of any Chemical Society is subject to election by a two-thirds majority of the Council.

At the present moment the Council has the following composition:

German Chemical Society:

Prof. W. Ostwald (President of the Association for the ensuing session, 1912), Prof. H. Wichelhaus (Vice-President), Prof. P. Jacobson (General Secretary).

The Chemical Society:

Prof. P. F. Frankland, Prof. R. Meldola (retired),* Prof. Sir Wm. Ramsay.

French Chemical Society:

Prof. Béhal, Prof. Haller, Prof. Hanriot.

Italian Chemical Society:

Prof. G. Carrarà, Prof. A. Oglialoro, Prof. E. Paternò.

Russian Chemical Society:

Prof. N. S. Kurnakow, Prof. L. A. Tschugaeff, Prof. P. J. Walden.

American Chemical Society:

Dr. A. L. Day, Prof. W. A. Noyes, Prof. Th. W. Richards.

Swiss Chemical Society:

Prof. F. Fichter, Prof. Ph. A. Guye, Prof. A. Werner.

The following Societies have also joined the Association, but are as yet unrepresented on the Council:

Nederlandsche Chemische Vereeniging.
Polyteknisk Forenings Kemikergruppe (Christiania).
Verein Oesterreichischer Chemiker (Vienna).
Kemisk Forening (Copenhagen).

At the Paris Conference it was resolved that the first work of the Association should be the appointment of Committees in each country, to whom should be entrusted the duty of drafting reports on each of the three subjects:

(*a*) Nomenclature of inorganic chemistry.
(*b*) Nomenclature of organic chemistry.
(*c*) Unification of the methods of notation of physical constants.

The following Committees have been appointed by the Council of the Chemical Society:

Inorganic Nomenclature.	*Organic Nomenclature.*
Sir Wm. Ramsay (Chairman).	Prof. W. P. Wynne (Chairman).
Dr. J. C. Cain.	Dr. J. C. Cain.
Dr. A. Harden.	Prof. F. S. Kipping.

Physical Constants.

Dr. N. T. M. Wilsmore (Chairman).
Dr. J. C. Cain.
Prof. A. Findlay.

* Prof. Arthur W. Crossley has been appointed by the Council of the Chemical Society to fill the vacancy caused by the retirement of Prof. Meldola.

These Committees, as well as the corresponding ones appointed by the several foreign Chemical Societies, have already sent in reports which will form the subject of discussion by the Council of the Association at their next sessions, commencing on April 11th in Berlin.

A Vote of Thanks to the Treasurer, Hon. Secretaries, Foreign Secretary, and Council for their services during the past year was proposed by Professor H. McLeod, seconded by Mr. S. P. U. Pickering, and acknowledged by Professor J. N. Collie.

In presenting the Longstaff Medal for 1912 to Dr. H. Brereton Baker, the President said:

"Dr. Brereton Baker,—It is my pleasant duty, on behalf of the Society, to make the Presentation of the Longstaff Medal, which has been awarded to you by the Council in recognition of your long-continued, faithful, and brilliant services to Chemical Science.

"Your numerous and remarkable researches on the inactivity of dry gases which culminated in the wonderful discovery that carefully dried oxygen and hydrogen can be heated to the temperature of molten silver without explosion, are of such fundamental importance that an account of them finds a place in the teaching which is imparted even to most elementary students of chemistry, whilst the explanation of your results still baffles all but those who delight in daring speculations.

"You have not, however, restricted yourself to the exploitation of this field in which your skilled labour has turned up so many treasures; but, undaunted by the failure of others, you have directed your attention to the study of the eccentric element tellurium, and have embarked with your great experimental resources on an inquiry into the much-discussed question of its purity. Although in this emprise you have failed to convict tellurium of being contaminated by any subtle attachment, for you have not shaken the accepted atomic weight of this element, yet the undertaking was distinguished by the care, the skill, and the thoroughness which we have learnt to associate with all your work.

"In handing you this medal I would take the opportunity of offering you my personal congratulations, as well as those of the Society, on your recent appointment to the Chair of Chemistry in the Imperial College of Science and Technology, and I would express the earnest hope that you may there, as the successor to Sir William Tilden and to Sir Edward Thorpe, find a congenial atmosphere in which to further prosecute your important researches."

The PRESIDENT then delivered his address, entitled, "Some Stereochemical Problems." Professor R. MELDOLA proposed a vote of thanks to the President, coupled with the request that he would allow his Address to be printed in the Transactions. The motion was seconded by Professor J. J. DOBBIE, and carried with acclamation, the PRESIDENT making acknowledgment.

The Report of the Scrutators was presented, and the PRESIDENT declared that the following had been elected as Officers and Council for the ensuing year:

President: Percy F. Frankland, Ph.D., LL.D., F.R.S.

Vice-Presidents who have filled the Office of President: H. E. Armstrong, Ph.D., LL.D., F.R.S.; A. Crum Brown, D.Sc., LL.D., F.R.S.; Sir William Crookes, O.M., D.Sc., F.R.S.; Sir James Dewar, M.A., LL.D., F.R.S.; Harold B. Dixon, M.A., Ph.D., F.R.S.; A. G. Vernon Harcourt, M.A., D.C.L., F.R.S.; R. Meldola, D.Sc., LL.D., F.R.S.; H. Müller, Ph.D., LL.D., F.R.S.; William Odling, M.A., M.B., F.R.S.; Sir William Ramsay, K.C.B., LL.D., F.R.S.; J. Emerson Reynolds, Sc.D., M.D., F.R.S.; the Rt. Hon. Sir Henry E. Roscoe, LL.D., F.R.S.; Sir Edward Thorpe, C.B., LL.D., F.R.S.; Sir William A. Tilden, D.Sc., F.R.S.

Vice-Presidents: G. T. Beilby, LL.D., F.R.S.; M. O. Forster, D.Sc., Ph.D., F.R.S.; A. Liversidge, LL.D., F.R.S.; E. J. Mills, D.Sc, LL.D., F.R.S.; G. T. Morgan, D.Sc.; W. J. Pope, M.A., F.R.S.

Treasurer: Alexander Scott, M.A., D.Sc., F.R.S.

Secretaries: Arthur W. Crossley, D.Sc., Ph.D., F.R.S.; S. Smiles, D.Sc.

Foreign Secretary: Horace T. Brown, LL.D., F.R.S.

Ordinary Members of Council: W. A. Bone, D.Sc., Ph.D., F.R.S.; W. R. Bousfield, M.A., K.C.; Adrian J. Brown, M.Sc., F.R.S.; H. G. Colman, D.Sc., Ph.D; A. Harden, D.Sc., Ph.D., F.R.S.; A. R. Ling; T. M. Lowry, D.Sc.; A. McKenzie, D.Sc., Ph.D.; H. Marshall, D.Sc., F.R.S.; J. C. Philip, D.Sc., Ph.D.; Sir Boverton Redwood, Bart., D.Sc.; E. J. Russell, D.Sc.

Thursday, April 18th, 1912, at 8.30 p.m., Professor PERCY F. FRANKLAND, LL.D., F.R.S., President, in the Chair.

The PRESIDENT referred to the loss the Society had sustained by the deaths of Dr. Edward Divers, F.R.S., and Mr. John Pattinson, who had served on the Council and as Vice-Presidents of the Society.

It was announced that the following Committees for 1912-1913 had been appointed by the Council:

Finance Committee: Messrs. E. G. Hooper, G. T. Moody, Sir Edward Thorpe, Sir William Tilden, and the Officers.

House Committee: Messrs. W. R. Dunstan, R. Messel, J. E. Reynolds, J. M. Thomson, Sir Edward Thorpe, Sir William Tilden, and the Officers.

Library Committee: Messrs. B. Dyer, W. Gowland, A. Harden, J. T. Hewitt, C. A. Keane, A. R. Ling, R. Meldola, E. J. Mills, J. C. Philip, J. M. Thomson (Chairman), Sir William A. Tilden, J. A. Voelcker, the Editor, and the Officers.

Publication Committee: Messrs. H. B. Baker, J. N. Collie, F. G. Donnan, B. Dyer, M. O. Forster, C. E. Groves, A. McKenzie, J. C. Philip, and the Officers.

Research Fund Committee Messrs. H. B. Baker, W. R. Bousfield, J. N. Collie, H. B. Dixon, J. J. Dobbie, M. O. Forster, A. Liversidge, R. Meldola, W. J. Pope, J. E. Reynolds, and the Officers.

Certificates were read for the first time in favour of Messrs.:

Thomas Allcock, The Rookery, Pye-Bridge, Alfreton.
Raymond Theodore Fred Barnett, B.Sc., 19, Merton Street, Swindon.
Charles James Vinall Bews, B.Sc., 52, Sir John's Road, Selly Park, Birmingham.
Harry Brindle, 225A, Oxford Road, Manchester.
Frank Lothian Cheshire, Mines Department, Brisbane, Queensland.
Alfred George Ernest Foster, 103, St. Mark's Road, Bristol.
Madanlal Jekisandas Gajjar, M.A., Heira House, Girgaum, Bombay.
Michael Francis Gallogly, B.A., St. Colman's College, Newry.
Robert Glegg, B.Sc., 19, Mount Street, Aberdeen.
Edmund Haworth Holden, M.Sc., 25, Curwen Street, Workington.
Edwin Oliver James, The Curatage, Low Moor.

Harold E. Kuntzen, Doric Lodge, Clapton Common, N.
James Leslie Auld Macdonald, B.Sc., 13, Howard Place, St. Andrews.
Nadirshaw Adarji Masani, M.A., B.Sc., Baroda Camp, India.
Harold McKee Langton, B.Sc., 80, Kingston Road, Ilford.
George Mason Williams, 17, Springcroft Avenue, Muswell Hill, N.

Certificates have been authorised by the Council for presentation to ballot under Bye-law I (3) in favour of Messrs.:

Jatindranath Ckakraborty, Goabagan, Calcutta.
Frederick George Whittick, Imperial Provincial College, Chinanfu, Shantung.

Of the following papers, those marked * were read:

***70. "Studies on platinocyanides." By Leonard Angelo Levy.**

The action of bromine on potassium platinocyanide has been reinvestigated, and it is found that Hadow's explanation of the reaction is correct, but that the constitution of the resulting product is represented by $6K_2Pt(CN)_4,K_2Pt(CN)_4,Br_2$, instead of the 5:1 formula given by him.

Lead and manganese dioxides oxidise potassium platinocyanide in the presence of dilute sulphuric acid, yielding a compound similar to the bromine additive product, in which Br_2 is replaced by SO_4. The salt behaves like the sulphate of a feebly electropositive element, and undergoes double decomposition with barium salts.

Hydrogen peroxide (and other peroxides in which the oxygen atoms are supposed to be linked in a chain) oxidises platinocyanides in the presence of dilute sulphuric acid, with the removal of one atom of the basic metal, forming compounds of the type $MPt(CN)_4$. These immediately combine with unchanged platinocyanide with the production of well-defined, crystallised double salts. The potassium compound has the composition

$$3K_2Pt(CN)_4,KPt(CN)_4,6H_2O.$$

These double salts are not acted on by hydrogen peroxide, hence the product of the reaction is a platino-platinicyanide of this type. An exception is afforded by hydroplatinocyanic acid, in which the combination is so feeble that the action of hydrogen peroxide completely oxidises this substance to the compound $HPt(CN)_4$.

The combination between the platino- and platini-cyanide is destroyed by oxidation with "perhydrol," the platinocyanide being completely oxidised to the form $MPt(CN)_4$. These salts are

true platinicyanides, bearing a relationship to platinocyanides similar to that existing between ferro- and ferri-cyanides. They may be regarded as compounds of the cyanides with platinum tricyanide, $MCN,Pt(CN)_3$. The oxidation of hydroplatinocyanic acid by hydrogen peroxide (6 per cent.) or "perhydrol" affords the readiest method of preparing the platinicyanides. Direct oxidation of metallic platinocyanides yields products which are mixed with the sulphate of the basic metal, and this is often very difficult to separate.

Discussion.

Prof. Emerson Reynolds congratulated Mr. Levy on his efforts to clear up the nature of some of the oxidation products of platinocyanides, although much still remained to be done. As illustrating this, he mentioned a curious observation of Sir J. Dewar's that an old specimen of supposed platinocyanide of lithium became *red* when cooled in liquid air, and lost the red colour when restored to the ordinary temperature. At Sir J. Dewar's request the speaker examined the specimen, which was nearly colourless—unlike pure, red, freshly prepared hydrated platinocyanide of lithium, which is bright green, and does not become red in liquid air. It had evidently undergone more or less oxidation in presence of a considerable excess of lithium cyanide, etc. This material when cooled in liquid air was seen to owe its red tint to minute red crystals distributed throughout, which were colourless at the ordinary temperature. The crystals closely resembled a large, orange-red crystal which the speaker had in his collection, and believed to be an oxidation product of a platinocyanide, having the formula $Li_2Pt(CN)_5,2H_2O$. This salt gave a colourless solution in water, from which colourless crystals were obtained, exhibiting a delicate lavender fluorescence; these contained 3 molecules of water of crystallisation. When cooled in liquid air these behaved just like Sir J. Dewar's salt, and gave the red dihydrate. On prolonged cooling a yellow monohydrate was formed as the red colour faded out. This remarkable example of successive dehydration by exposure to very low temperatures was reversed in presence of moisture as the normal temperature was reached. No compound exhibiting these characteristic properties had yet been met with among Mr. Levy's products, but the author would doubtless turn his attention in that direction, and the speaker hoped that he would obtain some clue to the constitution of the compound to which he (Prof. Reynolds) had now drawn their attention.

Mr. Levy, in reply to Prof. Reynolds, said that a compound of the composition $Li_2Pt(CN)_5$ could be regarded as a combination of lithium platinicyanide, $LiPt(CN)_4$, with one molecule of lithium

cyanide. The action of cyanides (and other alkalis) on the platinicyanides, $MPt(CN)_4$, resulted in the regeneration of a platinocyanide, as the former could not exist in alkaline solution. All attempts to synthesise the compound $Li_2Pt(CN)_5$ from lithium platinicyanide and lithium cyanide were therefore unsuccessful. No evidence of the formation of compounds of the type $M_2Pt(CN)_5$ was obtained in any of the experiments described.

***71. "Some reactions of β-naphthasulphonium-quinone." By Harold Christopher and Samuel Smiles.**

It was shown that interaction of β-naphthasulphonium-quinone with acetyl chloride or hydrogen chloride yields chloronaphthathioxin, whilst acetic anhydride furnishes acetoxynaphthathioxin. An explanation of this type of interaction was offered, and a further study of the naphthathioxin group was made. Attention was drawn to the conversion of the oxides of the naphthathioxin series into the chloro-derivatives by interaction with hydrogen chloride, and to the consequent resemblance between this series and those of thiodiphenylamine and thianthren.

***72. "Asymmetric quaternary arsonium compounds and their attempted resolution." By Thomas Field Winmill.**

The author described several new reactions of the arsines and their halogen derivatives. He has prepared phenylbenzylethyl-*n*-propylarsonium iodide, phenylethyl-*n*-propylallylarsonium bromide, and phenylbenzylmethylallylarsonium iodide, but has failed to resolve these substances into optically active components by means of *d*-α-bromocamphor-π-sulphonic and *d*-camphor-β-sulphonic acids.

73. "The condensation of ethyl sodiomalonate with ethyl citraconate and the synthesis of β-methyltricarballylic acid." By Edward Hope.

The author described in detail the condensation of ethyl sodiomalonate with ethyl citraconate, and discussed the mechanism of the production of a *cyclo*pentane derivative when the reaction is carried out in alcoholic solution. The synthesis of β-methyltricarballylic acid was also described.

74. "The formation and hydrolysis of esters of ketonic acids." By John Joseph Sudborough.

The esterification constants of several α-, β-, γ-, and δ-ketonic acids have been determined at 15° by the catalytic method, and in most

cases it is found that the introduction of carbonyl in place of a methylene group produces a retardation in the rate of esterification. It is also found that only those ketonic acids which are comparatively strong can be directly esterified by means of methyl alcohol.

The hydrolysis of the esters of some of the ketonic acids with water, dilute hydrochloric acid, and dilute alkali has been examined. With water and also with alkali the strength of the acid from which the ester is derived appears to be an important factor.

75. "Purpurogallin. Part II." By Arthur George Perkin.

Purpurogallone (Perkin and Steven, *Trans.*, 1903, **83**, 192), $C_{11}H_8O_5$, gives *ethyl purpurogallone trimethyl ether*, $C_{11}H_4O(OMe)_4$, colourless prisms, m. p. 81—83°, and the *dianilide*, $C_{23}H_{18}O_3N_2$, colourless leaflets, m. p. 202—203°. With alcoholic hydrogen chloride *ethyl purpurogallone*, $C_{11}H_7O_4(OEt)$, yellow needles, m. p. 151—153°, is obtained, and by distillation with zinc dust naphthalene is produced. iso*Purpurogallone*, $C_{22}H_{14}O_{10}$, also prepared by the action of alkali on purpurogallin, can be obtained by the action of sulphuric acid at 100°, or of sulphuric acid and persulphate at 0°, but more readily by oxidising purpurogallone in potassium acetate solution with potassium ferricyanide. *iso*Purpurogallone tetramethyl ether is obtained in small amount by the methylation of purpurogallone, whereas the *diethyl* compound, $(C_{11}H_6O_5Et)_2$, leaflets, m. p. 217—218°, is prepared from *iso*purpurogallone with alcohol and hydrogen chloride. With alcoholic potassium hydroxide at 170°, purpurogallin trimethyl ether gives *purpurogallone dimethyl ether*, $C_{13}H_{12}O_5$, m. p. 197—199°, from which the *anhydro*-compound, $C_{13}H_{10}O_4$, m. p. 164—166°, is formed by sublimation or by means of boiling acetic anhydride. With boiling hydriodic acid (D 1·7) purpurogallone gives β-naphthol, 2 : 3-dihydroxynaphthalene, and a trace of an acid, probably 2 : 3-dihydroxynaphthalenecarboxylic acid. Purpurogallone is probably a *trihydroxynaphthalenecarboxylic acid*, and *iso*purpurogallone the corresponding *hexahydroxydinaphthyldicarboxylic acid*.

76. "αδ-Derivatives of adipic and β-methyladipic acids." (Preliminary note.) By Harold Davies, Henry Stephen, and Charles Weizmann.

Ethyl αδ-diacetoxyadipate,

$$CO_2Et{\cdot}CH(OAc){\cdot}CH_2{\cdot}CH_2{\cdot}CH(OAc){\cdot}CO_2Et,$$

is obtained by heating ethyl αδ-dibromoadipate with anhydrous potassium acetate in glacial acetic acid solution. It is a white

solid melting at 73°, and distilling without decomposition at 195°/10 mm.

Ethyl **αδ-*diphthaliminoadipate*,**

$$CO_2Et\cdot CH\left(N<\begin{matrix}CO\\CO\end{matrix}>C_6H_4\right)\cdot CH_2\cdot CH_2\cdot CH\left(N<\begin{matrix}CO\\CO\end{matrix}>C_6H_4\right)\cdot CO_2Et.$$

is obtained on heating ethyl **αδ**-dibromoadipate with potassium phthalimide in xylene for twenty-four hours. It crystallises from alcohol in colourless needles melting at 115°. The free *acid* is obtained by (*a*) hydrolysis of the ester with a glacial acetic acid solution of hydrogen bromide at the ordinary temperature, or (*b*) by the hydrolysis of the ester with the necessary amount of alcoholic potassium hydroxide; it is a crystalline powder which does not melt at 270°.

αδ-*Diphthalaminoadipic acid*,

$$\begin{matrix}CO_2H\cdot CH(NH\cdot CO\cdot C_6H_4\cdot CO_2H)\cdot CH_2\\ CO_2H\cdot CH(NH\cdot CO\cdot C_6H_4\cdot CO_2H)\cdot CH_2\end{matrix}$$

is obtained by hydrolysing ethyl **αδ**-diphthaliminoadipate with concentrated aqueous sodium hydroxide according to Sörensen and Andersen's method (*Zeitsch. physiol. Chem.*, 1908, **56**, 266). When heated with concentrated hydrochloric acid, it yields αδ-diaminoadipic acid.

αδ-*Dibromo-β-methyladipic acid*,

$$CO_2H\cdot CHBr\cdot CHMe\cdot CH_2\cdot CHBr\cdot CO_2H,$$

is prepared by brominating **β**-methyladipyl chloride, and decomposing the product with anhydrous formic acid. On allowing the solution to remain for several weeks the acid crystallises. When recrystallised from anhydrous formic acid it melts at 138°.

The *methyl* ester boils at 167—168°/12 mm. The ethyl ester boils at 180°/10 mm.

Ethyl **αδ-*diacetoxy-β-methyladipate*,**

$$CO_2Et\cdot CH(OAc)\cdot CHMe\cdot CH_2\cdot CH(OAc)\cdot CO_2Et,$$

obtained in the same way as the analogous adipic compound, melts at 66° and boils at 182°/10 mm.

77. "Triketomethylenedioxyhydrindene"

By Siegfried Ruhemann.

Triketomethylenedioxyhydrindene hydrate,

$$CH_2<\begin{matrix}O\\O\end{matrix}>C_6H_2<\begin{matrix}CO\\CO\end{matrix}>C(OH)_2,$$

has been obtained from the corresponding derivative of α-hydrindone by the same method which led to the formation of triketohydrindene hydrate. It is much less soluble in water than the latter substance,

but gives the same colour-reaction with amino-acids. The compound has been studied on the same lines as the parent substance (see *Trans.*, 1910, **97**, 1438, 2025; 1911, **99**, 792, 1306, 1486).

78. "Aromatic antimony compounds. Part IV. Compounds of antimony trichloride with diazonium chlorides." By Percy May.

Several additive compounds of antimony trichloride with various diazonium chlorides have been prepared. These compounds, which crystallise well, are insoluble in water, and more stable than the parent diazonium chlorides. The decomposition products of these substances were also described.

79. "Note on the constituents of rhubarb." By Frank Tutin and Hubert William Bentley Clewer.

In a former communication (*Trans.*, 1911, **99**, 962) the authors described the isolation from rhubarb of a small amount of a substance (m. p. above 340°), which yielded an acetyl derivative melting at 335°.

It has since been ascertained that this substance is identical with the phenolic compound, jambulol, which has quite recently been described by Power and Callan (*Pharm. J.*, 1912, [iv], **34**, 416).

Jambulol possesses the empirical formula $C_{16}H_3O_4(OH)_5$, but its molecular weight could not be determined owing to its sparing solubility.

80. "olecular-weight determinations from the relative lowering of the vapour pressure of ethereal solutions." By Robert Wright.

By the following method the chief difficulties of molecular-weight determination from the relative lowering of the vapour pressure of solutions have been to some extent avoided.

Two small flasks of about 100 c.c. capacity are connected by means of mercury-sealed stoppers to a differential manometer of the form shown. The height of the whole apparatus is about 60 cm., the bulb on the stem below the U-tube is of 15 c.c. capacity, and the length of stem below the mercury-sealed vacuum tap is about 30 cm., the height of the cylinder being 15 cm.

In a molecular-weight determination, one of the flasks marked in a suitable manner is fitted with a stopper, and weighed. Next

2—4 grams of solute are introduced, and its weight determined. Both flasks are now three-quarters filled with ether, and connected with the apparatus, the tap being left open, and the whole is clamped in position over the cylinder of mercury.

By means of beakers of hot water the ether in both flasks is alternately boiled and allowed to cool, the cooling being accelerated by immersing the flasks in cold water. Three such boilings are usually sufficient to sweep all air out of the apparatus; the ether should now fill from a quarter to a third of each flask; care should be taken that none of the solute crystallises out. The outsides of the flasks are now dried, and the mercury allowed to mount in the gauge. As soon as the mercury has risen so as to occupy half the bulb, the ether which has condensed on the surface of the rising column is driven back into the flasks by gently heating the bulb with a small flame. It is advisable during this part of the operation to warm gently all that part of the gauge which is above the bulb.

The whole apparatus is now placed in a glass-fronted cupboard, and left for three or four hours, so that it may cool to the temperature of the room. Both flasks are now gently tapped so as to shake their contents, and ten minutes later the difference in height of the mercury columns read by means of a cathetometer. This difference—which should be about 3 cm.—is the lowering of the vapour pressure due to the solute. In order to disconnect the flasks, the apparatus is raised until the end of the gauge is only about 1 cm. below the surface of the mercury in the cylinder; the flasks are then, if necessary, gently warmed with the hand until the mercury in the manometer is depressed so as to occupy a level below the tap, which is then closed, and the whole apparatus lifted free from the cylinder. On opening the tap, air is admitted to the flasks, and the one containing the solution is disconnected, stoppered, and weighed, and by this means the weight of the ether obtained.

The molecular weight of the solute is now calculated from the formula:

$$\frac{f-f'}{f'} = \frac{W/M}{w/m},$$

where f and f' are the vapour pressures of solvent and solution, W and M the mass and molecular weight of the solute, and w and m those of the solvent.

The value of f, the vapour pressure of the pure solvent, is best obtained by noting the temperature of the experiment and consulting a table of vapour pressures, interpolating, if necessary, by means of the usual logarithmic rule. This avoids errors due to impurities in the ether, which will not affect the differential value $f-f'$.

The following are a few typical results; in general it will be seen that the errors are less than 10 per cent.

	M.W. found.	True M.W.
Nitrobenzene	129	123
Azobenzene	190	182
Benzoic acid	112	122
Aniline	98	93
Naphthalene	135	128

As the object of the experiments was not a research on vapour pressures, but a simple method of determining molecular weights, no great care was taken to obtain perfectly pure reagents. The ether was the methylated variety which had been washed and redistilled, and the solutes purified in the usual manner gave sharp melting or boiling points.

The stoppers used were of capillary rubber tubing, a substance not altogether suitable owing to the solubility of ether in it; but as the only effect of this solubility is the removal of some ether from the solution, the use of rubber does not materially affect the results.

81. "Electrolytic reduction. Part I. Unsaturated aldehydes and ketones." By Herbert Drake Law.

A large number of unsaturated aldehydes and ketones have been reduced on lead cathodes by the electrolytic method. The reaction takes place in stages, and commences at either the double linking or the carbonyl radicle. The products are saturated alcohols, unsaturated alcohols, or ketones of approximately the same molecular weight of the original substance, together with diketones and pinacones of double the molecular formula. The reaction proceeds quite readily with aliphatic and alicyclic compounds in either acid, alkaline, or neutral solvents. Reduction is most rapid when acid electrolytes are used, but products combined with the lead of the cathode are formed. The latter phenomenon is quite general with the compounds examined in both aliphatic and alicyclic series, and greatly interferes with the usefulness of the

reaction. The substances easiest to reduce are those containing the double linking and the carbonyl groups in adjacent positions. The separation of these two groups greatly reduces the reactivity, and compounds with only one of the groups are moderately stable. The two double linkings therefore mutually exalt the properties of the other when brought close together, but still retain their individuality.

82. "A method of estimating potassium iodate." By James Eckersley Myers.

When solutions of potassium iodate and oxalic acid are mixed together, or the substances suspended in water, a slight yellow colour is developed after several hours at the ordinary temperature.

On heating the mixture to 80°, a vigorous reaction commences, and continues without any further application of heat, with the evolution of carbon dioxide and iodine.

This reaction was examined quantitatively by Chrétien (*Ann. Chim. Phys.*, 1898, [vii], **15**, 358), and he found that the whole of the iodine present in the iodate was evolved in the free state, but gave no figures to indicate the degree of accuracy of the method. The present method is similar to Chrétien's, but can be carried out much more quickly.*

A weighed amount of pure potassium iodate is placed together with an excess of pure oxalic acid in a flask fitted with a ground-glass joint, which carries the exit tube. A tube for conducting steam into the flask is sealed into the side of the neck, and reaches nearly to the bottom of the flask. The arrangement of these tubes prevents the existence of the cul-de-sac which exists in an ordinary steam-distillation apparatus, and so allows the iodine to be swept out by the steam without obstruction. Steam is passed into the mixture so as to attain the temperature of reaction. When the iodine commences to be evolved, the flow of steam is slackened, and the iodine gradually swept out of the flask into a receiver cooled in ice, containing potassium iodide solution. If desired, this solution may be replaced by a mixture of potassium iodide and a known volume of standard sodium thiosulphate. After a short time the contents of the reaction flask become quite colourless, and no iodine remains in the delivery tube. After the steam has been stopped, the receiver is removed, and the tip of the delivery tube washed, the washings being placed in the receiver. If the iodine is collected in potassium iodide, this is titrated with standard sodium thio-

* The work described in the present communication was carried out in ignorance of Chrétien's investigation.

sulphate solution; if collected in thiosulphate solution the excess of this reagent is titrated with standard iodine. In either case a measure of the amount of iodine produced in the reaction is obtained. The following table shows the amounts of iodate used (*a*), the amounts of iodine produced (*b*), together with the ratio *a*/*b*:

TABLE I.

	a.	*b*.	*a*/*b*.
1.	0·283 gram	0·168 gram	1·684
2.	0·306 ,,	0·182 ,,	1·681
3.	0·486 ,,	0·292 ,,	1·674
4.	0·500 ,,	0·296 ,,	1·689
5.	0·601 ,,	0·357 ,,	1·683
6.	0·659 ,,	0·389 ,,	1·690
7.	0·994 ,,	0·589 ,,	1·687

The value for the ratio will be seen to be practically constant, and it agrees very well with the ratio $2KIO_3/I_2$, the calculated value of which is 1·685.

The next table shows a comparison of the amounts of iodine calculated on the assumption that two molecules of potassium iodate produce one molecule of iodine (*a*), with the amounts of iodine experimentally determined (*b*). *A* is the weight of iodate used.

	A.	*a*.	*b*.
1.	0·283 gram	0·168 gram	0·168 gram
2.	0·306 ,,	0·181 ,,	0·182 ,,
3.	0·486 ,,	0·288 ,,	0·292 ,,
4.	0·500 ,,	0·296 ,,	0·296 ,,
5.	0·601 ,,	0·356 ,,	0·357 ,,
6.	0·659 ,,	0·391 ,,	0·389 ,,
7.	0·994 ,,	0·589 ,,	0·589 ,,

The effects of various salts on the reaction are as follows:

Potassium Nitrate:—The amount of iodine produced as determined by titration is too high, probably owing to the formation of a little nitric acid which passes over to the potassium iodide solution and liberates iodine.

Potassium Chromate and *Sulphate*:—These salts do not affect the reaction.

Potassium Chloride and *Chlorate*:—These salts prevent the formation of iodine, although in the case of chlorate carbon dioxide is given off

Potassium Bromate:—On gently warming the mixture to about 30°, the bromate and oxalic acid react to form bromine and carbon dioxide. After some time the bromine ceases to be evolved, and the solution may be almost freed from bromine by gentle warming. On heating to about 80° the iodate and oxalic acid react to produce iodine and carbon dioxide. This reaction presents a convenient

method of detecting, qualitatively, a mixture of potassium bromate and iodate.

The action of oxalic acid on potassium bromate, both alone and in presence of other salts, is under investigation.

83. "The action of sodium hyposulphite on copper sulphate in aqueous solution." By James Brierley Firth and James Eckersley Myers.

This reaction has been examined under various conditions, and it has been found that the final products vary with the relative amounts of the reacting substances. When the copper salt is in excess the product is chiefly metallic copper, and this may be precipitated in a very active form, which on exposure to the air becomes light brown, and has then a composition indicating the presence of cuprous oxide. If the sodium hyposulphite is in excess, the product is chiefly cupric sulphide. The authors are unable to confirm the observation of Schützenberger that copper hydride is produced in the reaction.

An improved form of the apparatus used for precipitating, filtering, and drying in an inert gas was used in this investigation.

84. "The action of chloral on ethyl tartrate and on ethyl malate." By Thomas Stewart Patterson and Andrew McMillan.

Chloral condenses with ethyl tartrate to give an additive compound of the formula:

$$CO_2Et\cdot CH(OH)\cdot \begin{matrix} CH\cdot O \\ | \\ CO-O \end{matrix} > CH\cdot CCl_3,$$

and with ethyl malate to furnish the analogous compound:

$$CO_2Et\cdot CH_2\cdot \begin{matrix} CH\cdot O \\ | \\ CO-O \end{matrix} > CH\cdot CH_3.$$

85. "The alkylation of the ferro- and ferri-cyanides." By Ernald George Justinian Hartley.

Methyl sulphate reacts with potassium ferricyanide at 100°, reduction taking place, and the same products are obtained as when the ferrocyanide is employed.

Methyl iodide when heated with silver ferrocyanide in a sealed tube forms a compound, $Me_6FeC_6N_6I_2,4AgI$, which is decomposed by nitric acid or silver nitrate into the compound

$$Me_6FeC_6N_6(NO_3)_2,$$

and silver iodide. When silver ferricyanide and methyl iodide are similarly treated, reduction takes place according to the equation:

$$Ag_3FeC_6N_6 + 6MeI = Me_6FeC_6N_6I_2 + 3AgI + I.$$

The hexamethylferrocyanogen iodide then combines partly with the silver iodide and partly with the free iodine to form a periodide. The complete equation is:

$$4Ag_3FeC_6N_6 + 24MeI = 3Me_6FeC_6N_6I_2,4AgI + Me_6FeC_6N_6I_6.$$

86. "Nitrites of the alicyclic ammonium series. Part I. Nitrosopiperazinium nitrite." By Prafulla Chandra Rây and Jitendra Nath Rakshit.

When the filtrate from the double decomposition between piperazinium hydrochloride and silver nitrite in aqueous solution is allowed to evaporate slowly in a vacuum over sulphuric acid, the first crop or two of crystals consists of pure 1:4-dinitrosopiperazine. The last crops are those of *nitrosopiperazinium nitrite*,

$$NO\cdot N<\begin{matrix}CH_2\cdot CH_2\\CH_2\cdot CH_2\end{matrix}>NH,HNO_2.$$

87. "The molecular conductivities of potassium nitrite, mercuric nitrite, and potassium mercurinitrite." By Prafulla Chandra Rây and Nilratan Dhar.

From the conductivity measurements of the above salts it would appear that potassium mercurinitrite is almost completely decomposed in aqueous solution into its components, and that it does not consist of kalion, (K°), and mercurinitrosion, $Hg(NO_2)_4''$, as is supposed by Ostwald.

88. "A method of estimating tin in its ores, alloys, and compounds." By Manindra Nath Banerjee and Satish Chandra Banerjee.

Stannous chloride, prepared from tin ores, alloys, and compounds, is easily titrated with $N/10$-mercuric chloride solution, the indicator used being potassium iodide solution. The solution is "spotted" on a porcelain tile, and the end reaction is indicated when a drop of the tin solution under titration colours the iodide yellow owing to excess of mercuric chloride.

89. **"Condensation of acid chlorides with the ethyl esters of (*a*) cyanoacetic acid, (*b*) malonic acid, and (*c*) acetoacetic acid." (Preliminary note.) By Charles Weizmann, Harold Davies, and Henry Stephen.**

The following condensation products have been prepared with the view of using them for the preparation of amino-ketones and their derivatives:

Ethyl β-chloropropionylcyanoacetate,

$$CH_2Cl\cdot CH_2\cdot CO\cdot CH(CN)\cdot CO_2Et,$$

prepared from β-chloropropionyl chloride and ethyl sodiocyanoacetate, crystallises from a mixture of benzene and light petroleum, and melts at 68°; it gives a *copper* compound melting at 159°.

Ethyl phenoxyacetylcyanoacetate,

$$PhO\cdot CH_2\cdot CO\cdot CH(CN)\cdot CO_2Et,$$

prepared from phenoxyacetyl chloride and ethyl sodiocyanoacetate, yields a *copper* compound melting at 191°. The free condensation product prepared from this copper compound crystallises from light petroleum, and melts at 44°.

Ethyl ethoxyacetylmalonate, $EtO\cdot CH_2\cdot CO\cdot CH(CO_2Et)_2$, obtained from ethoxyacetyl chloride and ethyl sodiomalonate in dry benzene, is an oil boiling at 165°/19 mm.

Ethyl ethoxyacetylacetoacetate, $EtO\cdot CH_2\cdot CO\cdot CHAc\cdot CO_2Et$, prepared from ethoxyacetyl chloride and ethyl sodioacetoacetate in dry benzene, is best purified by means of the *copper* compound. It boils at 132—133°/12 mm.

Ethyl phenoxyacetylacetoacetate, $PhO\cdot CH_2\cdot CO\cdot CHAc\cdot CO_2Et$, obtained by condensing phenoxyacetyl chloride and ethyl sodioacetoacetate, is a solid melting at 85—86°. It is best purified through the *copper* compound, and gives the ferric chloride reaction.

Ethyl amyloxyacetylacetoacetate, $C_5H_{11}\cdot O\cdot CH_2\cdot CO\cdot CHAc\cdot CO_2Et$, prepared from sodium acetoacetate and amyloxyacetyl chloride, is a liquid boiling at 176°/14 mm.

Ethyl phthaliminoacetylmalonate,

$$C_6H_4\langle\begin{matrix}CO\\CO\end{matrix}\rangle N\cdot CH_2\cdot CO\cdot CH(CO_2Et)_2,$$

obtained from phthalylglycyl chloride and ethyl sodiomalonate in dry benzene, is a white solid, which crystallises from alcohol, and melts at 68°. When submitted to steam distillation in presence of dilute sulphuric acid, it yields phthaliminoacetone (m. p. 124°). The residue, an oil insoluble in sodium carbonate, yields, on crystallisation from alcohol, ethyl phthaliminoacetoacetate (m. p. 119°), identical with the compound described by Gabriel and Colman (*Ber.*, 1909, **42**, 1244). This substance does not give a coloration

with ferric chloride, but when its alcoholic solution is mixed with a solution containing an equimolecular quantity of potassium ethoxide in alcohol, a crystalline potassium compound is obtained, which, when dissolved in water and decomposed with cold dilute acetic acid, yields the enolic modification of *ethyl phthaliminoaceto-acetate*, melting at 70°, and gives a purple coloration with ferric chloride.

Ethyl phthaliminoacetylbromomalonate,

$$C_6H_4\langle\begin{matrix}CO\\CO\end{matrix}\rangle N\cdot CH_2\cdot CO\cdot CBr(CO_2Et)_2,$$

is obtained when ethyl phthaliminoacetylmalonate is treated with a 20 per cent. solution of bromine in chloroform. It crystallises from methyl alcohol in colourless needles melting at 123°.

Ethyl phthaliminoacetylchloromalonate,

$$C_6H_4\langle\begin{matrix}CO\\CO\end{matrix}\rangle N\cdot CH_2\cdot CO\cdot CCl(CO_2Et)_2,$$

prepared by heating phthalylglycyl chloride with the potassium compound of ethyl chloromalonate in dry benzene, crystallises from methyl alcohol in colourless needles, melting at 99°. On distillation in a current of steam in presence of dilute sulphuric acid, it yields phthaliminoacetic acid.

Ethyl β-phthaliminopropionylmalonate,

$$C_6H_4\langle\begin{matrix}CO\\CO\end{matrix}\rangle N\cdot CH_2\cdot CH_2\cdot CO\cdot CH(CO_2Et)_2.$$

obtained in a manner similar to that described in the preparation of ethyl phthaliminoacetylmalonate, crystallises from methyl alcohol in needles melting at 62°.

β-Phthaliminopropionic acid,

$$C_6H_4\langle\begin{matrix}CO\\CO\end{matrix}\rangle N\cdot CH_2\cdot CH_2\cdot CO_2H,$$

was obtained by hydrolysis of the corresponding amyl ester by means of concentrated hydrobromic acid at 40°.

Amyl β-phthaliminopropionate is easily obtained by heating molecular quantities of potassium phthalimide and amyl β-chloro-propionate. It melts at 56°, and distils at 220°/12 mm. without decomposition.

90. "The rate of reduction of carbon dioxide by carbon."

By Thomas Fred Eric Rhead and Richard Vernon Wheeler.

The velocity of the reaction $CO_2 + C \longrightarrow 2CO$ at different temperatures has been determined. The velocity of reaction increases with increase of temperature, the mean velocity ratios for a temperature interval of 10° diminishing fairly regularly as the temperature scale is ascended.

Thus, in a series of experiments in which a mixture containing 20 per cent. of carbon dioxide and 80 per cent. of nitrogen was employed, the following mean values of k at different temperatures were obtained $\left(k=\frac{1}{t}.\log\frac{C_o}{C_t}\right)$:

Temperature.	$k(t=1$ minute).
900°	0·00060
950	0·00374
1000	0·01764
1050	0·05760
1100	0·10570

The mean velocity ratios for an interval of 10°, obtained from the expression $\frac{k_{t+10}}{k_t}=10^{10b}$, are given in the following table, together with the values of b obtained from the experimental numbers:

Temperature range.	b.	k_{t+10}/k_t.
900— 950°	0·01589	1·44
950—1000	0·01346	1·36
1000—1050	0·01028	1·27
1050—1100	0·00527	1·13

91. "The combustion of carbon."
By Thomas Fred Eric Rhead and Richard Vernon Wheeler.

Work by previous experimenters regarding the first reaction that takes place when carbon burns in oxygen was discussed.

The alternatives are:

(*a*) $C+O_2=CO_2$, followed by
(*b*) $CO_2+C=2CO$;

and

(*c*) $2C+O_2=2CO$, followed by
(*d*) $2CO+O_2=2CO_2$.

The authors attempted to obtain evidence as to which reaction is most likely to take precedence at different temperatures, by determining the relative velocities of the above reactions under the same experimental conditions.

The results obtained showed (1) that some carbon monoxide is produced during the oxidation of carbon at low temperatures, under conditions which do not admit of the reduction of carbon dioxide by carbon. On the other hand, (2), carbon dioxide is produced at low temperatures in quantity which cannot be altogether accounted for by the supposition that carbon monoxide is first formed and then oxidised to carbon dioxide.

When carbon is burned at low temperatures, therefore, carbon dioxide and carbon monoxide are produced simultaneously.

An account of experiments made to discover the nature of the reaction responsible for this simultaneous production of the two oxides was reserved for a future communication.

92. "The use of phenolphthalein as an indicator. The slow rate of neutralisation of carbonic acid." By James William McBain.

It was shown that titrations with phenolphthalein as indicator require about ten minutes for the end-point to be attained, even in the absence of a gaseous space. This is not due to changes in the phenolphthalein, for these are not appreciable during many months in very low concentration of alkali (about $0{\cdot}7 \times 10^{-6}$ *N*-OH'). The phenomenon has been traced to the presence of carbon dioxide (carbonate), which is always intentionally or unintentionally present. It is uncertain which is the slow reaction, the rate of hydration of dissolved carbon dioxide or the rate of electrolytic dissociation of the carbonic acid.

Carbon dioxide affects the amount of phenolphthalein necessary to produce maximum depth of colour, but it also affects enormously the amount of acid or alkali required to change the colour of the end-point by a definite amount.

The very pale colour obtained at a concentration of $OH' =$ about $0{\cdot}7 \times 10^{-6}$ was shown to be the most sensitive colour for the end-point, and permanent colour standards were described which identify this region. It was recommended that in titrating, before either of the liquids to be titrated are placed in the titration vessel, the water in the latter should be coloured to the position of the final end-point with phenolphthalein and alkali.

93. "Some hydroxy-ketonic dyes."
By Jatindra Mohan Dutta and Edwin Roy Watson

On account of their resemblance to the flavones and butein, the following compounds have been prepared:

2:3:4-*Trihydroxyphenyl styryl ketone*,

$$(OH)_3C_6H_2{\cdot}CO{\cdot}CH{:}CH{\cdot}C_6H_5,$$

obtained by the condensation of cinnamic acid and pyrogallol with zinc chloride, forms chocolate-coloured, plate-like crystals, melting at 125—126°.

2:3:4-*Trihydroxyphenyl benzylmethyl ketone*,

$$(OH)_3C_6H_2{\cdot}CO{\cdot}CH_2{\cdot}CH_2{\cdot}C_6H_5,$$

prepared by condensing β-phenylpropionic acid and pyrogallol, crystallises in light pink, prismatic crystals, melting at 86—87°.

2:3:4-*Trihydroxyphenyl 2′-hydroxystyryl ketone*,

$$(OH)_3C_6H_2{\cdot}CO{\cdot}CH{:}CH{\cdot}C_6H_4{\cdot}OH,$$

prepared from *o*-hydroxycinnamic acid and pyrogallol, melts at 170°.

2:4-*Dihydroxyphenyl 2′-hydroxystyryl ketone*,

$$(OH)_2C_6H_3\cdot CO\cdot CH{:}CH\cdot C_6H_4\cdot OH,$$

prepared from *o*-hydroxycinnamic acid and resorcinol, melts at 124—126°.

2:4-*Dihydroxyphenyl 2′-hydroxynaphthyl ketone*,

$$(OH)_2C_6H_3\cdot CO\cdot C_{10}H_6\cdot OH,$$

prepared from β-naphtholcarboxylic acid and resorcinol, forms brown, plate-like crystals melting at 204—206°.

The *monoacetyl* derivative of *dihydroxynaphthaxanthone*,

$$C_{10}H_6\langle{}^{O}_{CO}\rangle C_6H_2(OH)\cdot O\cdot CO\cdot CH_3,$$

prepared by boiling 2:3:4-trihydroxyphenyl 2′-hydroxynaphthyl ketone with acetic anhydride and a trace of pyridine, melts at 200°.

Acetoxynaphthaxanthone, $C_{10}H_6\langle{}^{O}_{CO}\rangle C_6H_3\cdot O\cdot CO\cdot CH_3$, prepared similarly from 2:4-dihydroxyphenyl 2′-hydroxynaphthyl ketone, forms cream-coloured, needle-shaped crystals, melting at 217°.

3:4-*Dihydroxynaphthaxanthone*, $C_{10}H_6\langle{}^{O}_{CO}\rangle C_6H_2(OH)_2$, prepared by heating 2:3:4-trihydroxyphenyl 2′-hydroxynaphthyl ketone in a sealed tube with water, and also by the hydrolysis of its monoacetyl derivative, forms small, plate-like crystals, melting at 280—285°.

Hydroxynaphthaxanthone, $C_{10}H_6\langle{}^{O}_{CO}\rangle C_6H_3\cdot OH$, prepared by the hydrolysis of acetoxynaphthaxanthone, forms needle-shaped crystals which do not melt at 285°.

The dyeing properties of some of the above compounds were described.

94. "The externally compensated and optically active hydroxyhydrindamines, their salts and derivatives." By William Jackson Pope and John Read.

Methods were given for the preparation in quantity of externally compensated hydroxyhydrindamine, $C_6H_4\langle{}^{CH_2}_{CH(OH)}\rangle CH\cdot NH_2$, and for the resolution of this base into its optically active components by means of *d*-α-bromocamphor-π-sulphonic acid. The rotation constants of the *d*- and *l*-hydroxyhydrindamines and a number of their salts and derivatives have been determined.

95. "The four stereoisomeric optically active 2:4-dimethyltetrahydroquinolines." By John Thomas.

The molecule of 2:4-dimethyltetrahydroquinoline contains two asymmetric carbon atoms, and the synthetic product, obtained by the reduction of 2:4-dimethylquinoline, should therefore be resolvable into four optically active isomerides. The four isomerides in question can be isolated from the synthetic base by crystallisation with the *d*- and *l*-α-bromocamphor-π-sulphonic acids.

96. "The optical activity of salts and derivatives of *d*-camphor-β-sulphonic acid." By Joseph Ivon Graham.

For the purpose of ascertaining to what extent the molecular rotatory powers are dependent on concentration, the optical rotations (at constant temperature) of a number of salts of *d*-camphor-β-sulphonic acid in aqueous solution have been determined for the mercury-green, mercury-yellow, and sodium *D*-lines. In the case of the zinc, cadmium, and magnesium salts, no appreciable change in rotatory power is observed on increasing the concentration, whilst the barium, calcium, and copper salts show a diminution of rotatory power, and the ammonium and piperidine salts show an increase of rotatory power under similar conditions. On the other hand, no change in rotatory dispersion is produced by varying the concentration of the salts.

It is concluded that these changes cannot be dependent on variation of degree of electrolytic dissociation alone, but depend principally on the character of the metallic atom or electropositive group. The "piperido-lactone" of this acid is now proved to be the piperidine salt.

The rotation constants of other derivatives, for example, the chloride, piperidide, and the anhydramide, in chloroform solution have also been determined, and the influence of change of constitution on rotatory dispersion is illustrated in the case of the anhydramide in which the nitrogen atom has become linked to the carbon of the carbonyl group.

97. "Some mixed phosphonium derivatives." By William Jackson Pope and Charles Stanley Gibson.

The authors described the preparation of phenyl-*p*-tolylmethylallylphosphonium and phenyl-*p*-tolylbenzylmethylphosphonium compounds and related substances; they were unable to resolve these compounds, which contain an asymmetric quinquevalent phosphorus atom, into optically active components.

98. "The alkaloidal salts of phenylmethylphosphinic acid."
By William Jackson Pope and Charles Stanley Gibson.

Salts of phenylmethylphosphinic acid, $CH_3{\cdot}(C_6H_5)P{\cdot}O{\cdot}OH$, with *l*-menthylamine, cinchonine, cinchonidine, quinine, and *l*-hydroxyhydrindamine have been prepared and submitted to careful fractional crystallisation without evidence of resolution being obtained. It thus appears that phenylmethylphosphinic acid is not resolvable into optically active components.

99. "The state of ammonia in aqueous solution."
By Thomas Field Winmill.

For the calculation of the complete equilibrium,

$$NH_3 + H_2O \rightleftharpoons NH_4OH \rightleftharpoons NH_4' + OH',$$

it is necessary to know the "apparent dissociation constant" of ammonia, and also the partition-coefficient between water and an indifferent solvent at three temperatures. The necessary measurements have been made for ammonia, mono-, di-, and tri-methylamine, mono-, di-, and tri-ethylamine, and mono-, di-, and tri-propylamine at 18°, 25°, and 32·35°.

100. "The absorption spectra of some metallic solutions."
By Sir Walter Noel Hartley.

Konrad Schaefer has investigated the absorption spectra of nitrates (*Zeitsch. wiss. Photochem.*, 1910, **8**, 212), and whilst confirming the author's observations in all particulars (*Trans.*, 1902, **81**, 556; 1903, **83**, 221), has somewhat extended them.

Prior to the publication of this paper in 1903, the author had examined thin layers of molten potassium nitrate 0·5 mm. in thickness, but found no selective absorption. The absorption spectra of metallic nitrates and of alkyl nitrates, the former in the state of solution and solid (Schaefer), the latter both as liquid, as solution in alcohol, and as vapour, are indisputable evidence that the bands of absorption in the former belong to the salt molecule, and that as under no condition do the alkyl nitrates exhibit such selective absorption, their constitution must be essentially different. The effect of solution on the absorption spectra of different nitrates (with the author's explanation Schaefer does not agree) are explained on the view that they are not ionised.

101. "The absorption spectra of permanganates."
By Sir Walter Noel Hartley.

J. E. Purvis has examined the influence of dilution on the colour and the absorption spectra of various permanganates (*Proc. Camb.*

Phil. Soc., 1909, **15**, 111), but his views, based on ionisation, do not satisfactorily explain the changes observed. A simpler explanation is offered similar to that given in the case of nitrates which form basic salts, and in particular thorium nitrate. A similar change takes place in manganese nitrate and in manganese sulphate. In the latter salt a transient absorption band which is feeble becomes a continuous absorption, and is evidently caused by the oxidation of the salt in solution. It indicates the progress of a chemical reaction, and the band disappears when the reaction is completed.

ADDITIONS TO THE LIBRARY.

I. *Donations.*

Coste, *John Henry.* The calorific power of gas. A treatise on calorific standards and calorimetry. London 1911. pp. xvi + 310. ill. 6*s.* net. (*Recd.* 2/4/12.) From the Author.

Ferguson, *John.* Bibliotheca Chemica: A catalogue of the alchemical, chemical, and pharmaceutical books in the collection of the late James Young of Kelly and Durris, Esq., LL.D., F.R.S., F.R.S.E. Glasgow 1906. 2 vols. pp. xxi + 487, 598. Printed for private distribution. (*Recd.* 3/4/12.)

From the Trustees and Family of the late Dr. James Young.

Merck, *E.* Prüfung der chemischen Reagenzien auf Reinheit. 2nd edition. Darmstadt 1912. pp. v + 332. M.3.— (*Recd.* 21/3/12.) From the Author.

Parry, *Ernest John.* Food and drugs. Vol. I. The analysis of food and drugs (chemical and microscopical). Vol. II. The Sale of Food and Drugs Acts, 1875–1907. London 1911. pp. viii + 744, 181. ill. 28*s.* 6*d.* net. (*Recd.* 15/4/12.) From the Author.

II. *By Purchase.*

Süvern, *Karl.* Die künstliche Seide. Ihre Herstellung, Eigenschaften und Verwendung. 3rd edition. Berlin 1912. pp. xi + 631. ill. M.18.— (*Recd.* 26/3/12.)

III. *Pamphlets.*

Auerbach, *Friedrich,* and **Pick,** *Hans.* Die Alkalität wässeriger Lösungen kohlensaurer Salze. (From the *Arbeit. K. Gesundheitsamte*, 1911, **38**.)

Autenreith, *W.*, and **Müller,** *Gerhard.* Ueber die kolorimetrischen Bestimmungen des Zuckers, Kreatins und Kreatinins im Harn. (From the *München. med. Wochensch.*, No. **17**, 1911.)

Autenreith, *W.*, and **Funk,** *Albert.* Ueber de kolorimetrische Bestimmung des Milchzuckers im Harn und in der Milch. (From the *München. med. Wochensch.*, No. **32**, 1911.)

Ball, *John.* The meteorite of El Nakhla el Baharia. pp. 20. Cairo 1912.

Bang, *Ivar.* Ueber den chemischen Vorgang bei der Milchgerinnung durch Lab. (From the *Skand. Arch. Physiol.*, 1911, **25**.)

Barger, *George*, and **Dale,** *Henry Hallett.* β-Iminazolylethylamine a depressor constituent of in testinal mucosa. (From the *J. Physiol.* 1911, **41**.)

Blount, *Bertram.* Lectures on cement. pp. 64. ill. London 1912.

Corridi, *Lamberto.* Contributo allo studio dei prodotti di assorbimento dell' Iodio. (From the *Arch. Farm. sperim. Sci.*, 1911, **12**.)

Diamare, *Vincenzo.* Sur le diabète pancréatique chez les hétérothermes. (From the *Arch. ital. biol.*, **55**.)

Golding, *John.* Ropy milk. (From the *J. of the Board of Agric.*, 1912, **18**.)

Holmberg, *Bror.* Ueber optisch aktive Dibrombernsteinsäuren. (From the *Svensk Kemisk Tidskrift*, 1911.)

Metropolitan Water Board. Seventh report on research work. By *A. C.* **Houston.** pp. 79. London 1911.

RESEARCH FUND.

A meeting of the Research Fund Committee will be held in June next. Applications for grants, to be made on forms which can be obtained from the Assistant Secretary, must be received on, or before, Monday, June 3rd, 1912.

All persons who received grants in June, 1911, or in June of any previous year, whose accounts have not been declared closed by the Council, are reminded that reports must be in the hands of the Hon. Secretaries not later than Saturday, June 1st.

The Council wish to draw attention to the fact that the income arising from the donation of the Worshipful Company of Goldsmiths is more or less especially devoted to the encouragement of research in inorganic and metallurgical chemistry. Furthermore, that the income due to the sum accruing from the Perkin Memorial Fund is applied to investigations relating to problems connected with the coal-tar and allied industries.

VAN'T HOFF MEMORIAL FUND.

The Treasurer has forwarded to the van't Hoff Committee in Amsterdam the sum of £64 4s. (=770 Florins), being the subscriptions received by him from Fellows of the Society and others as per the following list:

	£	s.	d.
Mr. H. Bassett, sen.	0	10	6
Dr. G. T. Beilby	5	0	0
Mr. E. J. Bevan	1	1	0
Mr. W. R. Bousfield	1	1	0
Dr. Horace T. Brown	1	1	0
Dr. J. C. Cain	0	10	6
Cambridge University Chemical Club...	2	0	0
Mr. A. Chaston Chapman ...	1	1	0
Sir Arthur H. Church... ...	1	1	0
Prof. J. Norman Collie ...	1	1	0
Mr. C. F. Cross	1	1	0
Prof. Arthur W. Crossley ...	1	1	0
Prof. A. E. Dixon	1	0	0
Prof. H. B. Dixon	2	2	0
Dr. M. O. Forster	1	1	0
Prof. Percy F. Frankland ...	3	3	0
Prof. A. G. Green	1	1	0
Mr. A. J. Greenaway	0	10	6
Mr. C. E. Groves	1	1	0
Dr. A. G. Vernon Harcourt	1	1	0
Dr. A. Harden	1	1	0
Dr. J. T. Hewitt	1	1	0
Dr. A. Lapworth	1	1	0
Dr. H. R. Le Sueur	0	10	6
Carried forward ...	£31	2	0

	£	s.	d.
Brought forward ...	31	2	0
Dr. J. Lewkowitsch	1	1	0
Prof. G. D. Liveing	1	0	0
Prof. A. Liversidge	1	1	0
Dr. A. McKenzie	1	1	0
Prof. R. Meldola	1	0	0
Dr. R. Messel	5	0	0
Sir Henry A. Miers	1	0	0
Prof. G. T. Morgan	0	10	6
Dr. Hugo Müller	1	1	0
Prof. A. G. Perkin	2	2	0
Prof. W. H. Perkin	2	2	0
Dr. J. C. Philip	0	10	6
Mr. S. P. U. Pickering ...	1	1	0
Prof. T. Purdie	2	2	0
Sir William Ramsay	2	2	0
Sir Boverton Redwood... ...	1	1	0
Rt. Hon. Sir Henry E. Roscoe	1	0	0
Dr. S. Ruhemann	1	0	0
Dr. Alexander Scott	1	1	0
Dr. G. Senter	0	10	6
Prof. A. Smithells	1	1	0
Sir William A. Tilden ...	0	10	6
Dr. J. A. Voelcker	1	1	0
Prof. J. Walker	2	2	0
Prof. W. P. Wynne	1	1	0
Total	£64	4	0

The next Ordinary Scientific Meeting will be held on **Thursday, May 2nd, 1912, at 8.30** p.m., when there will be a ballot for the election of Fellows, and the following papers will be communicated:

"Nor-hyoscyamine and nor-atropine. Alkaloids occurring in various solanaceous plants." By F. H. Carr and W. C. Reynolds.

"Researches on the constitution of physostigmine. Part I." By A. H. Salway.

"The 'true' ionisation and hydration constants of ammonia and some amines, with a note on the formulation of nitrogen compounds." By T. S. Moore.

CERTIFICATES OF CANDIDATES FOR ELECTION AT THE NEXT BALLOT.

N.B.—The names of those who sign from "General Knowledge" are printed in *italics*.

The following Candidates have been proposed for election. A ballot will be held on May 2nd, 1912.

Arkell, Daniel,

South Lawn, Clanfield, Oxon.

Science Teacher. B.Sc. London University, 1901. Science Master, Ampleforth College, Yorks, 1902–1907. Science Master, S. Philip's Grammar School, Birmingham, 1908–1912. Science Master, Oratory School, Birmingham, 1908–present time.

Douglas F. Twiss. E. T. Bucknell.
T. Slater Price. W. B. Davidson.

Lionel M. Jones.

Bartow, Arthur Leslie,

"Kingscot," Ruislip.

Analytical Chemist and Bacteriologist. Assistant Analyst and Bacteriologist to the Belgravia Dairy Co., Ltd. Formerly student for 2 years in Chemistry department, Goldsmith's Institute, under Dr. Arthur Lapworth.

Arthur Lapworth. C. G. Moor.
Herbert E. Burgess. *H. Droop Richmond.*

Albert E. Bell.

Bones, Arthur Anderson,

640, Schoeman Street, Pretoria, South Africa.

Pharmacist. Managing Director of A. A. Bones & Co., Ltd., Pretoria, S. Africa, Manufacturing Pharmaceutical Chemists, by appointment to the Army and Civil Service in South Africa, and Manufacturers of Aerated Mineral and Medical Waters; formerly Assistant Pharmacist to Guy's Hospital, London.

B. Owen Jones. W. F. Wyley.
J. H. Dinwoodie. Hy. Williams Jones.

Thomas Maben.

Bryant, Ernest Gower,

100, Burlington Street, Manchester.

Principal of Northern College of Pharmacy, Manchester. Pharmaceutical Chemist. For the last eight years engaged in manufacturing Pharmacy and Analytical Chemistry, and teaching of Pharmacy.

Walter M. Gardner.	George Clayton.
Barker North.	G. T. W. Newsholme.
Robert Wright.	*R. L. Taylor.*

Bury, Charles Rugeley,

Ellfield, Wootton-under-Edge, Gloucestershire.

B.A. (Oxford). Demonstrator at Trinity and Balliol Colleges Laboratory. Engaged in Research.

D. H. Nagel.	N. V. Sidgwick.
H. B. Hartley.	A. F. Walden.

B. Lambert.

Cooper, Evelyn Ashley,

"Arborfield," Woodcote Valley Road, Purley, Surrey.

Beit Memorial Fellow for Medical Research at Lister Institute. Associate of Royal College of Science, London, in Chemistry, 1907. B.Sc. (2nd Class Honours in Chemistry), London, 1907. Bacteriological Chemist at "Sanitas" Co., Ltd., 1908–9. Jenner Memorial Scholarship for Bacteriological Research, Lister Institute of Preventive Medicine, 1910 and 1911.

James C. Philip.	Chapman Jones.
M. O. Forster.	Arthur Harden.

R. V. Norris.

Crowther, Raymond Edwin,

"Edenvale," Wigton Road, Carlisle.

Analytical and Textile Chemist. Author of "Formation of Isatin in the Dyeing of Indigo," *Journal of the Society of Dyers and Colourists*, June, 1911. Former Scholarship Student and present Associate of Municipal School of Technology, Manchester.

E. L. Rhead.	S. J. Peachey.
Edmund Knecht.	F. S. Sinnatt.
Jas. Grant.	Reginald B. Brown.

Dallas, William,

Burnbank Cottage, Mount Vernon, near Glasgow.

Assistant Analytical Chemist, with Messrs. Wm. Beardmore and Co., Ltd., Parkhead Steel Works, Glasgow, in the Armour Plate Department. For seven years with, and latterly Assistant Works

Manager to, the Shettleston Oil and Chemical Co., Ltd., Glasgow, Tar Distillers, Oil Refiners and Coke Manufacturers. For five months Works Chemist to Glengarnock Chem. Co., Ltd., Glengarnock. For one and a-half years, and presently, with Messrs. Beardmore, Ltd., Glasgow, as Assistant Analytical Chemist. Have studied Chemistry, Metallurgy and other subjects, including Bacteriology, at Glasgow Technical College ; and am a Student of the Institution of Mining and Metallurgy.

A. Campion. T. Cockburn.
G. G. Henderson. A. D. Gardiner.

Andrew S. Matchet.

Douglas, Robert Percy,
Prudential Buildings, Bolton.

Analytical and Consulting Chemist. Formerly held various positions in chemical laboratories ; acted as Foundry Chemist and Metallurgist, and now in private practice.

Douglas A. MacCallum. *A. Campion.*
A. Humboldt Sexton. *Jas. Grant.*
E. L. Rhead. *F. S. Sinnatt.*

Eastick, Frederick Charles, B.A.,
The Drive, South Woodford.

Analytical Chemist, Martineau's Sugar Refinery. Honours B.A. (Cantab.) (Chemistry, Physics and Botany). Studied at Rostock University, and then spent three months as Volunteer Chemist in Sugar Factory in Germany. Am desirous of keeping in touch with new work, especially on sugars.

W. J. Pope. John Joseph Eastick.
W. J. Sell. Chas. E. Eastick.
H. O. Jones. *G. D. Liveing.*

Evans, Elliott Alfred,
College of Agriculture, Holmes Chapel.

Demonstrator in Agricultural Chemistry. Student for three years with W. B. Hart, F.I.C., Consulting Chemist; at present Demonstrator in Agricultural Chemistry. Past student of the School of Technology Manchester.

Edmund Knecht. F. S. Sinnatt.
S. J. Peachey. Jul. Hübner.
F. G. Richards. Jas. Grant.

H. F. Coward.

Farlie, John Burke, Jnr.,

54, Wellington Road, Old Charlton, S.E.

Chemist. Assistant Metallurgist and Chemist, Royal Carriage Dept., Royal Arsenal, Woolwich. Sixteen years pupil and assistant to my father, Mr. J. B. Farlie, Royal Arsenal, Woolwich ; four years' training at Royal Arsenal Technical School. Studied also at Woolwich Polytechnic and Finsbury Technical College.

J. B. Farlie. H. Russell Pitt.
A. H. Mundey. *S. Field.*
W. Kellner.

Frankland, Edward Percy,

The Dell, Northfield, Birmingham.

Assistant Lecturer and Demonstrator, University of Birmingham. B.A. (Cambridge); Ph.D. (Würzburg); M.Sc. (Birmingham). Author of four publications in the Transactions of the Chemical Society.

H. J. H. Fenton. H. O. Jones.
W. J. Sell. Thomas Purdie.
F. W. Dootson. Hamilton McCombie.
Percy F. Frankland.

Hawkins, Walter Elmslie,

86, Park Lane, Croydon.

In the employ of a firm of Chemical Manufacturers. B.Sc. (Hons. Chem.) of London University. Three years a Student at the East London College ; engaged in chemical work, and desirous of keeping in touch with the development of Chemistry.

J. T. Hewitt. F. G. Pope.
Clarence Smith. A. D. Mitchell.
C. M. Stuart.

Hill, James Grainger,

124, Borneo St., Walsall, Staffordshire.

Analyst. Have been trained in Chemistry for seven years under Frank E. Thompson, Esq., A.R.C.S. Lond., F.I.C., F.C.S., M.R.S.I. ; and for five years under Walter Macfarlane, Esq., F.I.C., in Metallurgy Have passed 1st Class Stage I1I Practical Metallurgy, 2nd Class Stage 1II Practical Chemistry, and 1st Class (Honours) Stage III Iron and Steel, London and City Guilds. Have been in Partnership with Frank Ernest Thompson, F.I.C., F.C.S., practising as Analytical and Consulting Chemist at The Laboratory, Walsall, for almost five years (since March 25, 1907).

Frank E. Thompson. Harry Essex.
Arthur Adams. John H. Lavender.
C. Herbert Thompson.

Howells, Oliver Richard,

Bracondale School, Norwich.

Science and Mathematical Master in the above-mentioned school. Day-Student at East London College, 1905–1908 (Registered Internal Student of London University). Studied Chemistry, together with Physics and Mathematics. B.Sc. with 2nd Class Honours in Chemistry, 1908. Two years' training in General Commercial Analytical Chemistry, 1908–1911: (i) One year in laboratory of G. E. Railway, Stratford, London. (ii) One year in laboratory of Messrs. W. Canning & Co., Birmingham. Desire to keep up with recent research.

J. T. Hewitt.	A. D. Mitchell.
Clarence Smith.	J. J. Fox.
Frank G. Pope.	*C. Proud.*

Hughes, John Owen, B.Sc.,

University College of N. Wales, Bangor.

Assist. Lecturer and Demonstrator in Chemistry. Contributions to Chem. Science: British Association Reports, 1906, 1907, 1908, 1909, 1910, 1911, on the "Composition and Origin of the Crystalline Rocks of Anglesey."

Kennedy J. P. Orton.	Charles T. Heycock.
H. O. Jones.	J. E. Coates.

R. Gaunt.

Jones, Edgar Dingle,

3, Neville Road, Waterloo, near Liverpool.

Analytical Chemist. Twelve months pupil-assistant at Liverpool School of Science (Chemical Dept.); twelve months pupil-assistant to Mr. S. Andrade, B.A., B.Sc. (Camb.), B.Sc. (Lond.); five years apprentice to Chemistry and Manufacture of Sugar and Starch Glucose (Messrs. Freeman Lloyd & Co., Ltd., L'pool); six years, and at present, Chemist to Messrs. Fairrie & Co., Ltd., Sugar Refiners, L'pool.; Derby Science Prizeman, L'pool Technical School.

George Tate.	F. H. Sharpe.
Thomas J. Roberts.	John F. Haws.

Henry Fairrie.

Seymour-Jones, Richard Arnold,

Lyddon Hall, Virginia Road, Leeds.

Research Chemist in the Department of Applied Chemistry of Leather Manufacture. 1st Class B.Sc. Honours; M.Sc., Leeds University; two years' post-graduate research. Original papers on "Acids in Tan Liquors," and "Estimation of Mercuric Salts,"

"Action of Dilute Acids and Salt Solutions on Gelatine," and "Tanning Theory," all joint papers with H. R. Procter, M.Sc.

Henry R. Procter. H. M. Dawson.
J. B. Cohen. A. G. Perkin.
W. Lowson.

Knox, Archibald,
18, Newhall Terrace, Greenhead, Glasgow.

Analytical Chemist. Certificates gained at Glasgow Royal Technical College: Elementary and Advanced, Practical and Theoretical in the following subjects: Chemistry (Inorganic and Organic), Botany, and Bacteriology; also, Oils and Fats, Materia Medica, and Pharmacy. Experience: Five years with the late Dr. John Clark, City Analyst of Glasgow; three years with the Scottish Co-op. Chemical Dept.; two years, Works Manager with Robt. Young & Co., Chemical Manufacturers, Glasgow; at present in the employ of Messrs. Wm. Beardmore & Co., Ltd., Parkhead Forge, Glasgow.

G. G. Henderson. A. D. Gardiner.
Thomas Gray. Andw. S. Matchet.
A. Campion. *T. Cockburn.*

Lacey, Edwin Charles,
St. Julian's Lodge, West Norwood, S.E.

Technical Chemist. 1st B.Sc. Edin. Silver Medallist Honours Grade, City and Guilds of London.

R. Meldola. J. Tcherniac.
Frank E. Weston. Edward V. Evans.
M. J. A. Braun. *B. H. Buttle.*

Lampitt, Leslie Herbert,
Bowyer Road, Saltley, Birmingham.

Research Chemist. B.Sc. of Birmingham, Double First in Chemistry and Biological Chemistry. M.Sc. on result of research work on "Nitrogen Nutrition of Yeast." University Scholar, 1909–10; Research Scholar, 1910–11; Research Work continued, 1911–12.

Percy F. Frankland. C. K. Tinkler.
Adrian J. Brown. Thomas H. Pope.
Hamilton McCombie. *J. E. Coates.*

Lenfestey, Harold John de Quetteville,
50, Tettenhall Road, Wolverhampton.

Chemical Engineer. Three year Chemical Course under Prof. Armstrong, Central Technical College. Assistant Chemist, Associated Portland Cement Manufacturers, Ltd. Assistant Chemist, Messrs.

Kaye & Co., Ltd., Cement Manufacturers, Southam. Chief Chemist, Kennicott Water Softener Co. (present position).

Henry E. Armstrong. Edward Horton.
W. Robertson. *R. T. Colgate.*
F. P. Worley.

Lucas, William Thornton,
62, Mowbray Road, South Shields.

Schoolmaster (Science). Open Science Exhibition, Trinity Hall, Cambridge. Honours B.A. in Science (including Chemistry) at Cambridge (Nat. Sci. Trip. 1910). Late Science Master at Solihull Grammar School. Now Science Master at South Shields High School.

Arthur J. Cooper. W. A. R. Wilks.
W. J. Pope. F. W. Dootson.
H. J. H. Fenton. W. J. Sell.

Menon, Ambat Kesava,
45, York Grove, Peckham, S.E.

Chemist. Bachelor of Arts of Madras. A Member of the Society of Chemical Industry. Have read a paper on "Some Indian Oils and Fats" before the Society of Chemical Industry, London, December 1910. Engaged in the manufacture of soaps, etc.

J. Lewkowitsch. *Frank Clowes.*
E. Grant Hooper. *E. T. Shelbourn.*
J. H. Coste. *E. J. Jackman.*

O'Mara, James,
Dunlica, College Road, Dulwich, S.E.

B.A. Royal University of Ireland; scientific training. Director of Food Manufacturing Companies. Now pursuing chemical research work in biological chemistry connected with food industries.

Edward Divers R. H. Aders Plimmer.
Charles Dorée. J. A. Gardner.
Noel C. Akers.

Milbourne, Robert John, Assoc. M.Inst.C.E.,
Muxton Lodge, near Newport, Salop.

Chemical Engineer to Messrs. C. & W. Walker, Ltd., Midland Ironworks, Donnington, Newport, Salop. Engaged in designing, constructing, erecting and starting to work sulphate, liquid, and muriate of ammonia plants; sulphuric acid, and Claus sulphur plants; also apparatus for the purification of coal gas and the necessary

analytical work in connexion therewith. Three years' course in Theoretical and Practical Chemistry at the City of London College.

Thos. P. Blunt. N. H. Humphrys.
W. B. Davidson. W. H. Pendlebury.
James McLeod. *J. Wilkinson.*
A. V. Hendrickson.

Painter, George Macaulay,
"Rosemeade," Thundersley, Essex.

Lecture Demonstrator in Chemistry. Lecture Demonstrator in Chemistry Dept., Birkbeck College; B.Sc. (1st Class Honours in Chemistry) London University.

Alex. McKenzie. G. H. Martin.
G. W. Clough. J. H. Allworthy.
G. Martin.

Rennie, John,
"Maisonette," Rufford Park, Yeadon, near Leeds.

Technical Chemist and Manager for Messrs. W. B. Cartwright, Ltd., Manufacturing Chemists, Rawdon. Member of Pharmaceutical Society of Great Britain. Engaged in Technical, Pharmaceutical and Manufacturing Chemistry during the past ten years.

George Clayton. T. Armistead Ward.
F. Pilkington Sargeant. Joseph Brierley.
James B. Wilkinson.

Shute, Henry Alfred,
102, Meeting House Lane, Peckham, London, S.E.

Schoolmaster. B.Sc. Lond. (1st Hons. Chem). Formerly student in Sir William Ramsay's Laboratories at Univ. Coll., London. Senior Science Master at Kendal Grammar School, Westmorland.

William Ramsay. W. C. McC. Lewis.
R. Whytlaw-Gray. Samuel Smiles.
J. Norman Collie.

Singh, Bawa Kartar,
Dacca, Bengal.

Professor of Chemistry. Residence at Cambridge, 1904–1910. Natural Sciences Tripos, 1906; B.A., 1907; Professor at Dacca College since November, 1910.

E. R. Watson. W. A. R. Wilks.
W. J. Sell. F. W. Dootson.
H. O. Jones.

Thompson, Arthur,
Bryn Teg, Chetwynd Road, Wolverhampton.

Works Chemist. Formerly Assistant Chemist to Mr. C. Herbert Thompson, F.C.S., Amblecote Laboratory, Stourbridge; at present

time Chief Chemist in Enamelling Works of Messrs. Joseph Sankey & Sons, Bilston, Staffs. Desires to become a Fellow of the Chemical Society to keep in touch with the latest Chemical Research, and have access to the Library of the Chemical Society.

C. Herbert Thompson. Edgar Neumann.
William Thomson. *James Porter Shenton.*
Herbert William Hart.

Walker, George,

Stonehurst, Lancaster Road, Morecambe, Lancs.

Analytical Chemist. Associate of Royal School of Mines, London (A.R.S.M.). Analytical Chemist, Carnforth Iron Works.

E. O. Courtman. W. T. Clough.
W. H. Merrett. *F. B. Thole.*
A. E. Dunstan. *E. D. Griffiths.*

Wallace, Arthur,

1, St. Lawrence Road, Clontarf, Dublin.

Assistant in Chemistry to Prof. of Physiology, T.C.D. B.A. (Dub.). B.Sc. (Lond.), A.I.C. From 1908 to 1910 Demonstrator in Chemistry to Prof. of Chemistry, T.C.D.

Emil A. Werner. Wm. C. Ramsden.
Sydney Young. Wm. Caldwell.
Hans Krall.

Wilkins, Charles Reginald,

40, Church Lane, Hornsey, London, N.

Analytical Chemist. B.Sc. (Lond.), 2nd Class Honours in Chemistry, Two years in laboratory of Odams' Manure and Chemical Co. Fourteen years assistant to A. J. de Hailes, Esq., F.I.C., F.C.S. At present Chemist to Co-operative Wholesale Society, Ltd., Silvertown, E. Has also studied at Birkbeck College, Northern Polytechnic Institute, London, N., and Sir John Cass Technical Institute.

A. J. de Hailes. Charles A. Keane.
Alex. McKenzie. W. H. Mills.
J. T. Dunn.

The following Certificates have been authorised by the Council for presentation to Ballot under Bye-law I (3):

Chakraborty, Jatindranath, B.A.

Goabagan, Calcutta, India.

Director (technical) to the Oriental Soap Factory, Calcutta. Chimiste Diplômé de l'Université de Paris; (at present) Chemist to

the Oriental Soap Factory, Calcutta. Studied Inorganic Chemistry under M. Moissan and M. Le Chatelier; Organic Chemistry under Dr. Haller and Dr. Bouveaut; Analytical Chemistry under Dr. Urban at the Sorbonne; Biological Chemistry under Dr. Bertrand at the Pasteur Institute; Industrial Chemistry under Dr. Chabrié at the Institut de Chimie Appliquée (Paris), and worked in their respective laboratories.

P. C. Rây. G. C. Sen.

Jyoti Bhushan Bhaduri.

Thomson, John Scott,

c/o Messrs. Thomson & Co., Crawford St., Dunedin, N.Z.

Chemist, Manufacturer, and Brewer. Analyst to Messrs. Thomson and Co., Mineral Water Manufacturers and Brewers, Dunedin, N.Z., for the last eight years. Studied in laboratory of G. M. Thomson, Esq., M.P., F.C.S., Public Analyst. Making special study of ferments, etc., in connection with brewing. Interested in Chemical Science generally, and am desirous of coming in touch with current scientific literature.

T. May Smith. *B. C. Aston*

A. M. Wright.

Whittick, Frederick George,

Imperial Provincial College, Chi-nan-fu, Shantung, China.

Professor of English and Science (Chemistry and Physics). Teacher's Certificate, Board of Education. (Normal College, Bangor, 1895–97.) Student of Chemistry, Tech. School, Blackburn; F.R.G.S., M.R.A.S., Mem. Roy. Soc. Arts.

A. Willoughby-Henzell. Alfred Tingle.

R. CLAY AND SONS, LTD., BRUNSWICK ST., STAMFORD ST., S.E., AND BUNGAY, SUFFOLK.

[*Issued* 9/5/12

PROCEEDINGS

OF THE

CHEMICAL SOCIETY.

Vol. 28. No. 401.

Thursday, May 2nd, 1912, at 8.30 p.m., Professor E. J. MILLS, D.Sc., F.R.S., Vice-President, in the Chair.

Certificates were read for the first time in favour of Messrs.:

Cyril Douglas Birks, Cobnar Gardens, Woodseats, Sheffield.
William Henry Bowater, School of Mines, Charters Towers, Queensland.
Alfred Varlow Campbell, Rothamsted Experimental Station, Harpenden.
Bamacharan Chatterji, M.A., Scottish Churches College, Calcutta.
George Cruden Dieffenthaller, 7, Darcueil Lane, Belmont, Port of Spain, Trinidad.
Leonard Harding, Fern Lea, Russell Street, Eccles.
Harold Heron, 110, Fenchurch Street, E.C.
Thomas John Keenan, 751, East Nineteenth Street, Brooklyn, U.S.A.
Percival Edward Meadon, B.A., 6, Stanley Road, Oxford.
Eric Keightley Rideal, B.A., 28, Victoria Street, S.W.
Percy Wharton Waters, Glenbervie, Melrose Avenue, Brooklands, Sale, Manchester.

A Ballot for the election of Fellows was held, and the following were subsequently declared duly elected:

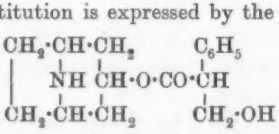
Daniel Arkell, B.Sc.
Arthur Leslie Bartow.
Arthur Anderson Bones.
Ernest Gower Bryant.
Charles Rugeley Bury, B.A.
Jatindranath Chakraborty, B.A.
Evelyn Ashley Cooper, B.Sc.
Raymond Edwin Crowther.
William Dallas.
Robert Percy Douglas.
Frederick Charles Eastick, B.A.
Elliott Alfred Evans.
John Burke Farlie, jun.
Edward Percy Frankland, B.A., Ph.D., M.Sc.
Walter Elmslie Hawkins, B.Sc.
James Grainger Hill.
Oliver Richard Howells, B.Sc.
John Owen Hughes, B.Sc.
Edgar Dingle Jones.
Richard Arnold Seymour-Jones, M.Sc.
Archibald Knox.
Edwin Charles Lacey, B.Sc.
Leslie Herbert Lampitt, M.Sc.
Harold John de Quetteville Lenfestey.
William Thornton Lucas, B.A.
Ambat Kesava Menon, B.A.
Robert John Milbourne.
James O'Mara, B.A.
George Macaulay Painter, B.Sc.
John Rennie.
Henry Alfred Shute, B.Sc.
Bawa Kartar Singh, B.A.
Arthur Thompson.
John Scott Thomson.
George Walker.
Arthur Wallace, B.A., B.Sc.
Frederick George Whittick.
Charles Reginald Wilkins, B.Sc.

Of the following papers, those marked * were read:

***102. "Nor-hyoscyamine and nor-atropine; alkaloids occurring in various solanaceous plants." By Francis Howard Carr and William Colebrook Reynolds.**

Nor-hyoscyamine—the secondary base corresponding with hyoscyamine—was described, and shown to occur in a number of different species of plants of the natural order Solanaceæ, namely, in *Scopolia japonica*, *Datura metel*, *Datura meteloides*, *Duboisia myoporoides*, and *Mandragora vernalis*, all of which also contain hyoscyamine.

The chemical constitution is expressed by the formula:



which is supported by the evidence: (1) that the alkaloid contains no NMe group; (2) that it forms a nitrosoamine, and therefore contains an :NH group; (3) that methyl iodide reacts with it, forming hyoscyamine; and (4) that it yields by hydrolysis tropic acid and nor-tropanol—a previously known base.

Nor-hyoscyamine is lævorotatory, and is racemised by the action of dilute alkali. The racemic base, nor-atropine, gives atropine on

methylation with methyl iodide. It therefore bears the same relation to atropine as nor-hyoscyamine does to hyoscyamine.

The properties of these two new alkaloids and their salts were described. Evidence was given to prove that the supposed isomeride of hyoscyamine, called ψ-hyoscyamine, described by Merck, is in reality nor-hyoscyamine.

The best method of distinguishing nor-hyoscyamine and nor-atropine from each other and from the other mydriatic alkaloids, is by the melting points and crystalline form of various salts, particularly the oxalates, aurichlorides, and picrates.

Nor-hyoscyamine and nor-atropine produce contraction of the pupil of the eye of the cat, but the activity is about one-eighth that of the corresponding *N*-methyl derivative.

***103. "Researches on the constitution of physostigmine. Part I." By Arthur Henry Salway.**

Physostigmine, when distilled with zinc dust, yields a mixture of 1- and 2-methylindoles. The author concludes that physostigmine contains a benzene nucleus attached to nitrogen, whilst it is not improbable that the atomic grouping, $C_6H_4<\begin{matrix}C\\N\end{matrix}>C$, is also present in the alkaloid.

The hydrolytic product of physostigmine, namely, eseroline, $C_{13}H_{18}ON_2$, first prepared by Ehrenberg in 1893, has been found to be a monacidic tertiary base, containing one methyl group attached to nitrogen. Its *hydrochloride*, *picrate*, and *methiodide* were described.

The oxidation products of physostigmine and eseroline have also been investigated. The so-called "eserine blue" has now been isolated in a pure condition. This base, $C_{17}H_{23}O_2N_3$, yields crystalline salts with two equivalents of an acid. It has an intensely blue colour, and in the presence of acids shows a brilliant carmine-red fluorescence.

When physostigmine or eseroline is allowed to absorb two atoms of oxygen in the presence of alkalis, rubreserine, $C_{13}H_{16}O_2N_2$, is formed. This substance, previously isolated by Eber (*Pharm. Zeit.*, 1888, **33**, 611), has been re-examined. It is a neutral substance, but yields salts both with acids and bases. Its *aurichloride*, *hydrochloride*, *picrate*, and *silver* salt were described.

***104. "The resolution of benzoylalanine into its optically active components." By William Jackson Pope and Charles Stanley Gibson.**

The equilibrium method of Pope and Peachey can be conveniently applied in the resolution of externally compensated benzoylalanine into its optically active components. The rotation constants of *d*- and *l*-benzoylalanine have been determined in a number of solvents for mercury-green, mercury-yellow, and sodium light.

105. "The 'true' ionisation and hydration constants of ammonia and some amines, with a note on the formulation of nitrogen compounds." By Tom Sidney Moore.

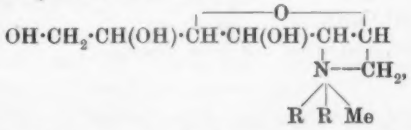
The author has applied the method of calculation previously described by him (*Trans.*, 1907, **91**, 1373) to the results of the measurements of the partition-coefficients and "apparent" ionisation constants of ammonia, the methylamines, the ethylamines, and primary and secondary propylamines carried out by Winmill (this vol., p. 109). The results do not bring to light any simple relation between the constitution of an amine and the value of its ionisation constant and hydration constant, but show that there is a great contrast in ionising power between the quaternary hydroxides and the hydroxides of primary, secondary, and tertiary amines.

A modification of Werner's theory of ammonium compounds has been proposed to explain the observed relations.

106. "The conversion of *d*-glucosamine into *d*-glucose." By James Colquhoun Irvine and Alexander Hynd.

The essential results of this investigation have already been published in a preliminary note (*Proc.*, 1912, **28**, 54).

It has now been found that α-aminomethylglucoside and its *N*-alkyl homologues, which are obtained as intermediate compounds in the conversion of glucosamine into glucose, are not to be regarded as simple glucosides. The reactions of the free bases are best explained by the general structure:



where R = the methyl group or hydrogen. It was also shown that

many of the reactions of glucosamine may be explained in terms of a formula of the above type.

The possibility of the conversion of glucosamine into glucose being accompanied by a Walden inversion was discussed, and reasons were given for the conclusion that a structural change of this nature does not take place. Glucosamine may thus be regarded as α-amino-*d*-glucose.

107. "The chlorination of iodophenols. Part I. The chlorination of *p*-iodophenol." By Sidney Albert Brazier and Hamilton McCombie.

When an ice-cold solution of *p*-iodophenol in carbon tetrachloride is saturated with chlorine, an iodo-dichloride separates, which decomposes with evolution of hydrogen chloride, and the formation of 2-chloro-4-iodophenol. This compound, in turn, when chlorinated, yields an unstable iodo-dichloride, which, on decomposition, furnishes 2:6-dichloro-4-iodophenol. In a similar way, 2:3:6-trichloro-4-iodophenol and 2:3:5:6-tetrachloro-4-iodophenol can be obtained.

In contradistinction to the free phenols, the acetyl and the benzoyl derivatives yield extremely stable iodo-dichlorides, which have been prepared and analysed. There is one exception to this, namely, the acetyl derivative of *p*-iodophenol, the iodo-dichloride of which decomposes after being kept for ten days.

When a solution of *p*-iodophenol in carbon tetrachloride kept at a temperature of 50—60° is saturated with chlorine, there are obtained 2 : 3 : 5 : 6-tetrachloro-4-iodophenol, pentachlorophenol, 2:3:4:4:5:6-hexachloro*cyclo*hexadienone (Zincke and Schaum, *Ber.*, 1894, **27**, 546), and chloroanil.

It was found that no iodo-dichloride could be prepared when the two ortho-positions relative to the iodine atom were occupied by chlorine atoms. This is in agreement with the observations of Willgerodt (*Ber.*, 1910, **43**, 2755; *Annalen*, 1911, **385**, 351).

Another interesting case of steric hindrance was encountered in attempting to prepare the benzoyl derivatives of phenols in which the two ortho-positions relative to the hydroxyl group were occupied with chlorine atoms. The ordinary Schotten-Baumann reaction failed in these cases, but the pyridine method yielded quite satisfactory results.

108. "The monohalogen derivatives of acenaphthene." By Holland Crompton and Maggie Walker.

The preparation and some of the physical properties of chloro-, bromo-, and iodo-acenaphthene were described. The melting points

of mixtures of these compounds with each other, and also of their mixtures with acenaphthene, have been determined. Chloro- and bromo-acenaphthene form isomorphous mixtures, but there is no indication of the formation of such mixtures in any of the other cases.

109. "Quinone-ammonium derivatives. Part I. The methylation products of picramic and *iso*picramic acids." By Raphael Meldola and William Francis Hollely.

The product of extreme methylation of *iso*picramic acid by methyl sulphate in presence of alkali described in a preliminary note published in 1910 (*Proc.*, **26**, 232) has been studied in detail, and its composition as a trimethyl derivative confirmed. The production of a similar compound from picramic acid has also been observed. Full consideration of the possible formulæ for these compounds has led to the conclusion that they are nitro-derivatives of the hypothetical quinone-ammonium type, $C_6H_4<\overset{O}{\underset{NH_3}{|}}$ or $C_6H_4<\overset{O}{\underset{NH_3}{\|}}$, the trimethyl derivatives of which were prepared by Griess in 1880 (*Ber.*, **13**, 246 and 647). This has been proved by the synthesis of the new nitro-derivatives by the direct nitration of Griess's compounds. The formulæ proposed are:

$$O{:}C_6H_2(NO_2)_2{:}N(CH_3)_3 \quad \text{or} \quad \underset{|_____|}{O{\cdot}C_6H_2(NO_2)_2{\cdot}N}(CH_3)_3.$$

Alternative formulæ in which one of the nitro-groups assumes the "aci"-form have also been considered, and the question of internal linking is for the present left undecided. The compound from *iso*picramic acid forms a scarlet hydrate, which becomes ochreous on drying owing to conversion into the quinone-ammonium derivative. The authors have discussed in a preliminary way the connexion between the colour and chemical constitution of these compounds, and have arrived at the conclusion that the red hydrate has the structure of a "quinole."

110. "Latent heats of vaporisation of mixed liquids. Part III. Mixtures of associated with non-associated liquids. New criteria for the detection of solvates in mixtures of liquids." By Daniel Tyrer.

In continuation of previous work, the latent heats of mixed liquids have been determined in the following cases: (1) Benzene and ethyl alcohol, (2) chloroform and methyl alcohol, (3) chloroform and acetone, (4) carbon tetrachloride and ethyl alcohol.

In each case one of the constituents is an associated liquid. In addition, determinations have been made of the boiling points of the mixtures and the compositions of the mixed saturated vapours. It was found that case (3) gives a maximum boiling point, and the other three cases all give minimum boiling points. At these maximum and minimum points the curves for the latent heats at constant pressure and constant composition intersect. By the aid of the additive law of mixtures, which was previously shown to be approximately true for latent heats, the apparent latent heats of the associated constituents in each mixture have been calculated. It was found that, as the concentration of the associated constituent diminishes, its apparent latent heat, instead of gradually diminishing as would be expected as a result of the progressive dissociation of the associated molecules, in all cases increases, at least over a portion of the range.

This was shown to be clear indication of the existence of solvates in these mixtures.

111. "Nickelo- and palladio-dithio-oxalic acids."
By Humphrey Owen Jones and Charles Stanley Robinson.

The highly coloured and stable complex salts derived from the dibasic acids, nickelo- and palladio-dithio-oxalic acids, were described in a former paper (*Trans.*, 1912, **101**, 62). These two acids have now been isolated and examined.

Nickelodithio-oxalic acid, $Ni(COS)_4H_2,4H_2O$, separates from aqueous solutions in lustrous, black prisms often exceeding 1 centimetre in length. Solutions of the acid have higher electrical conductivities than equivalent solutions of sulphuric acid. The acid decomposes in solution at 100° to give four gram-molecules of hydrogen sulphide and one of nickel oxalate from one gram-molecule of the acid, together with oxalic acid, carbon monoxide, and carbon dioxide in variable proportions, the sum of the oxalic acid and carbon monoxide being one gram-molecule.

Palladiodithio-oxalic acid, $Pd(COS)_4H_2,3H_2O$, separates from concentrated aqueous solutions in small, dark brown plates. It is a strong acid, but is less stable than the corresponding nickelo-acid.

112. "Dithiomalonates."
By Humphrey Owen Jones and Charles Stanley Robinson.

By the action of potassium hydrosulphide on amyl dithiomalonate in alcoholic solution, potassium dithiomalonate, $CH_2(COS)_2K_2$, is obtained. This salt reacts with metallic salts in a very similar

manner to potassium dithio-oxalate, and with aniline hydrochloride yields malonanilide and hydrogen sulphide.

The colour of the complex nickelodithiomalonate is perceptible at a dilution of 1 part of nickel in 4,000,000 of water, whilst that of the corresponding dithio-oxalate is perceptible at dilutions of 1 in 40,000,000.

Several salts of the complex nickelodithiomalonic acid,

$$Ni[CH_2(COS)_2]_2H_2,$$

and palladiodithiomalonic acid, $Pd[CH_2(COS)_2]_2H_2$, were described.

113. "The 'crude fat' of Beta vulgaris." By Allen Neville.

The ethereal extract of the dry matter of the common mangel was examined and found to contain triglycerides, free fatty acids, and two neutral substances. The free and combined fatty acids consisted largely of palmitic, oleic, and erucic acids, whilst the two neutral substances were of phytosterol nature, and gave results on analysis corresponding with the empirical formulæ $C_{31}H_{58}O_2$ and $C_{29}H_{45}O_2$ respectively.

114. "An experimental investigation of the bleaching process. Part II. The action of neutral salts on bleaching solutions." By Sydney Herbert Higgins.

The author showed that chlorides of sodium and calcium stimulate the bleaching actions of chlorine-water and of hypochlorous acid, as well as that of hypochlorite solutions. In all cases the action is precisely the same; it is an immediate one, after which action the solutions behave as though the chlorides had not been added. These observations are opposed to the representation of the bleaching action of hypochlorites in the presence of chlorides as being due to the development of chlorine according to the equation:

$$NaCl + NaOCl + H_2O = 2NaOH + Cl_2,$$

for this explanation does not account for the observations on the other bleaching solutions, and if it were true one would expect sodium chloride to cause a steady acceleration (and not a sudden action) as long as any sodium hypochlorite remained in solution. The reversible actions:

$$(1)\ HCl + HOCl = H_2O + Cl_2,$$
$$(2)\ NaOH + Cl_2 = NaCl + HOCl,$$

were found to explain all observations, including the behaviour of bleaching powder solution with neutral chlorides. The bleaching

trials were performed on weak solutions of dyestuffs, and on the colouring matters of cotton and linen cloth. In all cases practically the same results were obtained, showing that the same chemical actions took place during the oxidation of all the colouring matters used. The action of carbon dioxide on bleaching powder was discussed from equation (2) in support of the author's previous statement (*Trans.*, 1911, **99**, 858). Solutions of neutral salts were also found to decrease the stability of solutions of potassium permanganate in air and to increase their bleaching effect, so that for permanganate solutions, as for hypochlorites, it is evident that instability and bleaching effect are related.

115. "The chemistry of the aconitic acids." (Preliminary note.)

By Norman Bland and Jocelyn Field Thorpe.

A general method for the preparation of aconitic acid and of its alkyl derivatives has been found in the condensation of ethyl chlorofumarate and the sodium compound of ethyl malonate. Under ordinary conditions this condensation leads to the production of ethyl *cyclo*propanetetracarboxylate, thus (Ruhemann, *Trans.*, 1902, **81**, 1212):

$$CO_2Et\cdot CH{:}CCl\cdot CO_2Et + CHNa(CO_2Et)_2 \longrightarrow \begin{matrix} CO_2Et\cdot CH \\ | \\ CO_2Et\cdot CH \end{matrix} > C(CO_2Et)_2 + NaCl.$$

but in the presence of excess of sodium ethoxide ring-formation is prevented, and the yellow sodium compound of ethyl carbethoxyaconitate is produced:

$$CO_2Et\cdot CH{:}CCl\cdot CO_2Et + CHNa(CO_2Et)_2 \longrightarrow OEt\cdot C(ONa){:}CH\cdot C(CO_2Et){:}C(CO_2Et)_2 + NaCl + EtOH.$$

The sodium compound is not dissociated by water, and the aqueous solution yields the free ester when treated by carbon dioxide. From the fact that the ester is completely extracted by alkali from its solution in ether and gives a red coloration with ferric chloride, it follows that it is probably entirely enolic in structure. When hydrolysed by acids it is converted into aconitic acid.

The action of methyl iodide on the sodium compound produces ethyl carbethoxy-γ-methylaconitate (compare Ruhemann, *loc. cit.*, p. 1213), an ester which can be isolated in its structurally distinct ketonic and enolic forms. The *keto*-form,

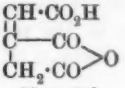
$$CO_2Et\cdot CMe{:}C(CO_2Et)\cdot CH(CO_2Et)_2,$$

boils at 215°/18 mm., gives no coloration with ferric chloride, and is not extracted from its solution in ether by aqueous alkali. The *enol*-form, $CO_2Et\cdot CMe{:}C(CO_2Et)\cdot C(CO_2Et){:}C(OH)\cdot OEt$, is an oil which is stable at the ordinary temperature, but passes slowly back

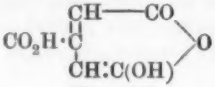
to the ketonic modification on distillation. It gives a red coloration with ferric chloride, and is extracted from its ethereal solution by alkali.

It is hoped that by this method alkylated and dialkylated derivatives of aconitic acid can be prepared, and that a comparison of these substances with the corresponding derivatives of glutaconic acid will supply important evidence respecting the influence exerted by the carboxyl group on the β-carbon atom of the three-carbon system.

Aconitic acid is a remarkable example of the different effect produced by a pure and an impure reagent on the course of a reaction. When treated with acetyl chloride containing phosphorus trichloride [Kahlbaum's acetyl chloride (II)], it is quickly converted into the anhydro-acid (I), melting at 76°, as found by Anschütz and Bertram (*Ber.*, 1904, **37**, 3967). If, however, pure acetyl chloride is used, dehydration takes place more slowly, and the product is the hydroxy-anhydro-acid (II):



M. p. 76°.
(I.)



M. p. 133°.
(II.)

The hydroxy-anhydro-acid crystallises from ethyl acetate in needles which melt at 133°. It behaves on titration as a dibasic acid, and gives a deep reddish-brown coloration with ferric chloride. It is probable that the anhydro-acid melting at 95° (Easterfield and Sell, *Trans.*, 1892, **61**, 1009) is a mixture of the two anhydrides mentioned above. The anhydro-acid melting at 76° is converted into the hydroxy-anhydro-acid melting at 133° by the action of acetyl chloride.

ADDITIONS TO THE LIBRARY.

I. *Donations.*

Auld, *Samuel James Manson.* An introduction to quantitative analysis. London 1912. pp. x + 215. ill. 5*s.* (*Recd.* 3/5/12.)
From the Publishers: Messrs. Methuen and Co., Ltd.

Hampshire, *Charles H.* Volumetric analysis for students of pharmaceutical and general chemistry. London 1912. pp. vii + 104. ill. 3*s.* 6*d.* net. (*Recd.* 26/4/12.)
From the Publishers: Messrs. J. & A. Churchill.

Molinari, *Ettore.* Trattato di chimica organica generale e applicata all'industria. 2nd edition. Milano 1912. pp. xxiv. + 1087. ill. L.18. (*Recd.* 26/4/12.) From the Publisher: Ulrico Hoepli.

Tables annuelles de constantes et données numériques de chimie, de physique et de technologie. Publiées sous le patronage de l'Association internationale des Académies par le Comité international nommé par le VII^e^ Congrès de Chimie appliquée (Londres, 2 Juin, 1909). Volume I. Année 1910. Paris 1912. (*Reference.*) pp. xxxix + 727. From the International Committee.

Thole, *Ferdinand Bernard.* Qualitative organic analysis. London 1912. pp. x + 68. ill. 1*s* 6*d*. (*Recd.* 3/5/12.)
From the Publishers: Messrs. Methuen and Co., Ltd.

III. *Pamphlets.*

Schmidt, *Ernst.* Ueber die Polysulfhydrate des Brucins. (From the *Apoth. Zeit.*, 1911.)

Steinmann, *A.* Etude critique sur les essais de platine. (From the *J. suisse chim. phys.*, 1911.)

Willard, *J. T.*, and **Swanson**, *C. O.* The baking qualities of flour. (From the *Chem. Phys. Papers Kansas Acad. Sci.*, [1911].)

RESEARCH FUND.

A meeting of the Research Fund Committee will be held in June next. Applications for grants, to be made on forms which can be obtained from the Assistant Secretary, must be received on, or before, Monday, June 3rd, 1912.

All persons who received grants in June, 1911, or in June of any previous year, whose accounts have not been declared closed by the Council, are reminded that reports must be in the hands of the Hon. Secretaries not later than Saturday, June 1st.

The Council wish to draw attention to the fact that the income arising from the donation of the Worshipful Company of Goldsmiths is more or less especially devoted to the encouragement of research in inorganic and metallurgical chemistry. Furthermore, that the income due to the sum accruing from the Perkin Memorial Fund is applied to investigations relating to problems connected with the coal-tar and allied industries.

ERRATA.

Proceedings, 1912.

Page 77, line 5 from top, *for* "March 25th" *read* "March 28th."
,, 94 ,, 12 ,, ,, "ethyl" *read* "methyl."
,, 94 ,, 22 ,, ,, "tetramethyl" *read* "octamethyl."
,, 98 ,, 15 from below, *for* "Part I" *read* "Part VI."
,, 101 ,, 10 ,, ,, "$CH{\cdot}CH_3$" *read* "$CH{\cdot}CCl_3$."

The next Ordinary Scientific Meeting will be held on **Thursday, May 16th, at 8.30** p.m., when the following papers will be communicated:

"Azo-dyestuffs of the triphenylmethane group." By A. G. Green and R. N. Sen.

"Aniline black and allied compounds. Part II." By A. G. Green and A. E. Woodhead.

"Action of Grignard reagents on esters of dibasic acids. (Preliminary note.)" By J. T. Hewitt and D. B. Steinberg.

"Chemical examination of the bark of *Euonymus Atropurpureus*." By H. Rogerson.

"The constitution of aminotyrosine and the action of oxydases on some tyrosine derivatives." By C. Funk.

"Furan-2:5-dialdehyde." By W. F. Cooper and W. H. Nuttall.

"The dynamic isomerism of ammonium thiocyanate and thiocarbamide." By W. R. G. Atkins and E. A. Werner.

"The distillation and densities of mixtures of allyl alcohol and water. Part I." By T. A. Wallace and W. R. G. Atkins.

"A modification of the Beckmann apparatus by which constant readings are obtained in determining the boiling points of aqueous solutions." By E. Knecht and J. P. Batey.

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[*Issued* 30/5/12

PROCEEDINGS

OF THE

CHEMICAL SOCIETY.

Vol. 28. **No. 402.**

Thursday, May 16th, 1912, at 8.30 p.m., Dr. M. O. Forster, F.R.S., Vice-President, in the Chair.

Certificates were read for the first time in favour of Messrs.:

Arthur Fred Campbell, M.Sc., Westwood, Middleton, Manchester.
Leslie Melville Clark, 3, Harley Road, Hampstead, N.W.
Bhupati Nath Das, M.A., B.Sc., Wari, Dacca, Eastern Bengal.
Gerard Irvine Davys, Capt. I.M.S., B.A., M.D., B.Ch., Beechview, Kidbrook Grove, Blackheath, S.E.
Donald M. Fergusson, c/o Acadia Sugar Refining Co., Ltd., Halifax, Nova Scotia.
Harold Hartley, M.Sc., Fernbank, Little Switzerland, Douglas, I. of M.
Henry Medley Hatherly, 14, Stackpool Road, Southville, Bristol.
Max Henius, Ph.D., 1135, Fullerton Avenue, Chicago, Ill., U.S.A.
Edward Lewis James, Holly Lodge, Larkhall Rise, Clapham, S.W.
William Jewell, 44, Highfield Road, Dartford, Kent.
Frederick James Meister, 1, Stanley Terrace, Alva.
Robert Charles Menzies, 27, Cluny Drive, Edinburgh.
Sidney Morgan, Rubber Growers' Association Laboratory, Pataling, Kuala Lumpur, F. M. States.
George Ernest Pearson, Prospect Cottage, Sutton, nr. Hounslow.

William Daveridge Hamilton Shaw, B.Sc., c/o Coppée Coke Oven Co., Ltd., King's House, Kingsway, W.C.
William Thévenaz, D. és Sc., 48, Grey Street, Hull.
William Leonard Thomas, 10, Victor Road, Bradford.

Certificates have been authorised by the Council for presentation to ballot under Bye-law I (3) in favour of Messrs.:

Chatindra Mohan Dutta, M.A., Dacca College, Dacca, India.
Anakul Chandra Sircar, M.A., Dacca College, Dacca, India.

Of the following papers, those marked * were read:

*116. "Aniline-black and allied compounds. Part II."

By Arthur George Green and Arthur Edmund Woodhead.

Willstätter and Cramer (*Ber.*, 1911, **44**, 2162) have advanced the view that the product of reduction of emeraldine or nigraniline with titanium trichloride or phenylhydrazine in the cold is not as the authors have stated leucoemeraldine,

$$C_6H_5\cdot NH\cdot[C_6H_4\cdot NH]_4\cdot C_6H_4\cdot NH_2,$$

but the mono-quinonoid compound,

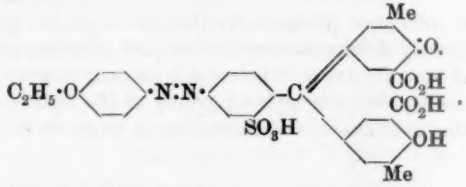
$$C_6H_5\cdot NH\cdot[C_6H_4\cdot NH]_4\cdot C_6H_4\cdot NH.$$

Such a view is improbable in face of the fact that the base is practically colourless, but in order to remove all doubt the compound has been subjected to the action of boiling titanium trichloride in an atmosphere of carbon dioxide. The compound remained unaltered, and only a slight change in the titre of the titanium trichloride (due to air oxidation) occurred.

It must therefore be concluded that the base is actually the leuco-compound, and does not contain a quinonoid group. The true mono-quinonoid compound (protoemeraldine) was prepared by reduction of emeraldine with sulphurous acid. It is a violet base forming yellowish-green salts, and dissolves in 80 per cent. acetic acid with a grass-green colour. These observations confirm the previous conclusions of the authors as to the number of quinonoid groups in the primary oxidation products of aniline. The "aniline-blacks" of Willstätter and Dorogi are mixtures of these primary products with polymerised derivatives, due to the action of the mineral acid used in purification, and cannot be regarded as identical with the true aniline-black formed on the fibre.

***117. "Azo-dyestuffs of the triphenylmethane group." By Arthur George Green and Rajendra Nath Sen.**

With the object of ascertaining the effect on the colour exerted by two chromophors, the azo-group and the carbinol group present in the para-position with respect to each other, the authors have prepared a series of azotriphenylmethane and azotriphenylcarbinol dyestuffs by condensing azoaldehydes, such as phenetoleazobenzaldehydesulphonic acid, $OEt{\cdot}C_6H_4{\cdot}N_2{\cdot}C_6H_3(SO_3H){\cdot}CHO$, with 2-hydroxytoluic and salicylic acids. The condensation occurs readily in cold concentrated sulphuric acid solution, giving azotriphenylmethane derivatives, which by reason of the presence of the azo-group are yellow dyestuffs. On oxidation with nitrosyl sulphate they are converted into azotriphenylcarbinols, as, for example, the compound



The latter are well defined polygenetic dyestuffs, dyeing wool directly in red shades, and producing various colours with different metallic mordants. The chromium lakes, which are black, can also be produced on the wool fibre by dyeing with the azotriphenylmethane dyestuffs, and then boiling the wool with an acidified solution of sodium dichromate, when both oxidation and combination with chromium occur together, and the colour changes from yellow through maroon to black.

The conclusion is drawn that the colour of these dyestuffs is an additive effect produced by the two chromophors acting separately.

***118. "Investigations on the dependence of rotatory power on chemical constitution. Part III. The rotatory powers of *ac*-tetrahydro-2-naphthol and some of its esters." By Robert Howson Pickard and Joseph Kenyon.**

ac-Tetrahydro-2-naphthol has been resolved into its optically active components by the fractional crystallisation from acetone of the *brucine* and *cinchonidine* salts of the *hydrogen phthalic ester*. The active alcohols have a considerably higher rotatory power ($[\alpha]_D \pm 67{\cdot}2°$ in 5 per cent. chloroform solution) than that previously given (Pickard and Littlebury, Trans., 1906, **89**, 1254), and

crystallise very readily from light petroleum in long needles which melt at 50°.

A series of esters of the active alcohols with normal fatty acids (acetic to lauric) has been prepared. The values of the molecular rotatory powers of these gradually diminish from the propionate until the nonoate term is reached, after which the value increases. In close agreement with these results are the determinations of the effect of temperature on the rotatory power of these esters. The *acetate* with $[M]_D^{20}$ 109·2°, *propionate* with $[M]_D^{20}$ 116·2°, n-*valerate* with $[M]_D^{20}$ 113·7°, n-*heptoate* with $[M]_D^{20}$ 111·5°, and the n-*nonoate* with $[M]_D^{20}$ 102·0° were obtained as viscid oils at the ordinary temperature, whilst the *laurate* with $[M]_D^{20}$ 107·9° solidifies to a crystalline mass and melts at 36°.

Discussion.

Dr. A. E. Dunstan pointed out that it would be possible, by means of viscosity determinations, to find out whether the mixture of the *d*- and *l*-tetrahydronaphthols was a racemic mixture or a true compound, seeing that the melting points of the optical antipodes were low enough to enable measurements to be made in the liquid state.

*119. "Chemical examination of the bark of Euonymus atropurpureus." By Harold Rogerson.

A description was given of a complete examination of the root-bark of *Euonymus atropurpureus*, Jacquin (Nat. Ord. *Celastraceae*). The new substances which have been isolated and characterised comprise a new crystalline acid, *furan-β-carboxylic acid*, $C_5H_4O_3$ (m. p. 121—122°); a new crystalline alcohol designated *euonymol*, $C_{21}H_{30}O_4$ (m. p. 248—250°), and a series of new alcoholic substances which give colour reactions similar to the phytosterols, and have been designated *euonysterol*, $C_{31}H_{51}O{\cdot}OH$ (m. p. 137—138°), *homo-euonysterol*, $C_{40}H_{69}O{\cdot}OH$ (m. p. 133—134°), and *atropurol*, $C_{27}H_{44}(OH)_2$ (m. p. 283—285°) respectively.

Various other definite substances have also been isolated and identified, amongst which may be mentioned dulcitol, $C_6H_{14}O_6$; citrullol, $C_{22}H_{36}O_2(OH)_2$; and a mixture of fatty acids. No evidence was obtained of the presence of a glucoside in the bark.

Discussion.

Mr. Finnemore asked if the substance euonymol obtained in small quantities from the aqueous extract had been tested pharma-

cologically. Seeing that the drug had been shown by Meyer to contain a heart poison, it seemed to be of some interest, as euonymol appeared to give the same colour reactions as cynotoxin, the heart poison obtained from *Apocynum*.

Mr. ROGERSON, in reply to Mr. Finnemore, stated that euonymol had not been physiologically tested; and in reply to Dr. Harden said that *Euonymus atropurpureus*, Jacquin, was a good source of dulcitol, the yield being equivalent to 2·09 per cent. of the weight of root-bark taken.

*120. "Furan-2 : 5-dialdehyde."
By William Francis Cooper and Walter Harold Nuttall.

In the preparation of dehydromucic acid by the oxidation of ω-chloromethylfurfuraldehyde with nitric acid, a considerable quantity of furan-2 : 5-dialdehyde is produced if the reaction is retarded by cooling. A small quantity of a crystalline acid (m. p. 196—197°), probably furan-2-aldehyde-5-carboxylic acid (pyromucic aldehyde), is also formed.

Furan-2 : 5-dialdehyde is a white, crystalline compound melting at 109·5—110°, which on oxidation gives dehydromucic acid. It is characterised by the blue colour which it gives with thymol and excess of sulphuric acid.

The *diphenylhydrazone* (m. p. 206—207°), *dioxime* (m. p. 212·5—213°), *dianilide* (m. p. 160—161°), and *β-naphthylamine* derivative (m. p. above 230°) were described.

The dialdehyde is also formed in the retarded oxidation of ω-hydroxymethylfurfuraldehyde with nitric acid. ω-Hydroxymethylfurfuraldehyde is most conveniently prepared by pouring crude ω-chloromethylfurfuraldehyde into a large excess of almost boiling water, without the presence of any reagent capable of reacting with the liberated hydrogen chloride (namely, silver nitrate or barium carbonate) as recommended hitherto.

β-Naphthylamine is a very convenient reagent for the identification of aldehydes of the furan series.

The *β-naphthylamine* derivatives of methylfurfuraldehyde (m. p. 87—88°) and ω-hydroxymethylfurfuraldehyde (m. p. 131—132°) were described.

*121. Researches on santalin. Part I. Santalin and its derivatives."
By John Cannell Cain and John Lionel Simonsen.

The authors have examined the saplings of *Pterocarpus santalinus* (red sanderswood), and have investigated the colouring matter, santalin, contained in the wood of the tree.

The colourless saplings contain free sugar and a *glucoside*, which on hydrolysis decomposes into a *phlobaphen* and dextrose. Santalin, whether obtained from the wood as grown in India, from the rasped wood imported into England, or from the commercial dyestuff, has the formula $C_{15}H_{14}O_5$, and melts at 226°. It forms *diacetyl*, *nitrodiacetyl*, and *dibenzoyl* derivatives, and the *nitro-* and *benzeneazo-*derivatives have been prepared, as well as the *oxime* and *dimethyl ether* and its *nitro*-derivative. Oxidation of the dimethyl ether furnishes veratric and anisic acids, and the nitrodimethyl ether when oxidised yields anisic acid and probably a nitroveratric acid.

122. "Action of Grignard reagents on esters of dibasic acids." (Preliminary note.) By John Theodore Hewitt and David Bernard Steinberg.

By the action of magnesium phenyl bromide on diethyl phthalate, Shibata (*Trans.*, 1909, **95**, 1449) obtained a compound of the formula $C_{26}H_{18}O$, melting at 194—195°, to which he assigned the constitution:

$$C_6H_4\begin{<}C(C_6H_5)_2\\C(:C_6H_4)\end{>}O,$$

Certain theoretical conclusions as to the nature of the benzene nucleus were based on the assumption that the compound contained the phenylene group attached to a single carbon atom.

Following Shibata's directions, a compound is obtained identical with diphenylanthrone synthesised by Haller's method from phenyloxanthronyl chloride and benzene in presence of aluminium chloride, as shown by appearance, solubilities, and mixed melting point, 193°. Shibata's observation that the compound is stable towards bromine and potassium permanganate is thus readily explained.

123. "The constitution of aminotyrosine and the action of oxydases on some tyrosine derivatives." By Casimir Funk.

An attempt has been made to prepare an optically active 3:4-dihydroxyphenylalanine by the action of nitrous acid on aminotyrosine, which was considered to be 3-aminotyrosine. In this way an optically inactive compound was isolated, which possessed the composition of the initial product, but differed from the latter in the colour of the crystals, melting point, and behaviour towards oxydases.

It was concluded therefore that aminotyrosine is a mixture of

2- and 3-aminotyrosine, the product obtained being 2-aminotyrosine. Further, the action of laccase and tyrosinase on amino- and hydroxy-tyrosine and adrenaline was tested, and it was found that both ferments are able to oxidise these substances.

124. "The dynamic isomerism of ammonium thiocyanate and thiocarbamide." By William Ringrose Gelston Atkins and Emil Alphonse Werner.

A careful study of the freezing points of mixtures of the two isomerides at temperatures above 130° shows a deviation from the simple form of the freezing-point composition diagram given by Findlay (*Trans.*, 1904, **84**, 403). Evidence has been obtained indicating the presence in the fusion of the compound

$$(CSN_2H_4)_3NH_4SCN;$$

this undergoes dissociation, even below its apparent melting point (144°).

The form of the curve obtained clearly shows that the true melting point of thiocarbamide itself lies at about 200°; the very rapid reversion which takes place before this temperature can be reached renders its experimental realisation impracticable. The reversion has also been studied in aqueous and in alcoholic solution; the results obtained in the former case confirm the work of Dutoit and Gagnaux (*J. Chim. phys.*, 1906, **4**, 261).

Values were given for the velocity constant of the reversion of ammonium thiocyanate in the liquid phase; the mean value of K_1 is 0·00295, as compared with $K_1=0·00633$ found by Waddell (*J. Physical Chem.*, 1898, **2**, 525).

The series of tetrathiocarbamide alkali iodide compounds has been completed by the preparation of the rubidium and cæsium derivatives, $(CSN_2H_4)_4RbI$ (m. p. 202°) and $(CSN_2H_4)_4CsI$ (m. p. 191°).

Lithium and sodium iodides do not form any compounds with thiocarbamide.

The compound $(CSN_2H_4)_4KI$ has already been described (Werner, *Proc.*, 1906, **22**, 245).

Thiocarbamide and potassium thiocyanate unite to form the compound $(CSN_2H_4)_3KSCN$ (m. p. 143°), analogous to the above ammonium compound.

125. "Properties of mixtures of allyl alcohol and water. Part I." By Thomas Arthur Wallace and William Ringrose Gelston Atkins.

In order to be able to analyse accurately the mixtures of the alcohol with water during the subsequent work, a complete density-

composition diagram was plotted for 0°. Analysis may also be satisfactorily carried out by a slight modification of the bromine absorption method. A large contraction in volume was found, amounting to 2·54 per cent. with a mixture containing 39 per cent. of alcohol when determined at 0°. The pure alcohol had D^0_0 0·86929 and boiling point 96·95°. The alcohol and water afford a binary mixture of constant boiling point, as already known. The composition of this is 72 per cent. of alcohol and 28 per cent. of water, and its boiling point is 88·0°. In determinations of the above composition, the middle-point distillation method of S. Young gave values which agreed closely with those obtained from the density curve. The behaviour of the alcohol on distillation with benzene and water is at present under investigation.

126. "A modification of the Beckmann apparatus." By Edmund Knecht and John Percy Batey.

The authors find that by employing a heating coil of suitable resistance, internal electrical heating can be used in the Beckmann apparatus for determining the molecular weight of substances in aqueous solution without electrolysis taking place. Quite constant readings are obtained without any special precautions. The apparatus has been used for determining the molecular weights of certain dyestuffs, such as benzopurpurine and indigo-white.

127. "Alkaline cupri-compounds." By Spencer Umfreville Pickering.

Twenty-four cupri-compounds of tartaric and racemic acids were described, representable by ten general formulæ, derived either from a molecule of the copper salt or of the double salt of copper and the alkali metal, by the copper atom becoming quadrivalent, and the introduction of OH, OM', or O_2Cu'' groups through the action of alkali. Four of the salts are represented by the empirical formula $(R_2CuM'_2)_3,5CuO$; in the others, which are alkaline in reaction, the ratio of copper to alkali metal is 1:1, 1:2, 1:2·5, 1:3, 1:4, 1:5, and 1:6. All the compounds except those with the ratio 1:1 are crystalline. Copper racemate itself exists in two different forms, one of which is probably a "cupri"-salt, and is much more soluble than the ordinary racemate.

128. "The constituents of West Indian satinwood." By Samuel James Manson Auld and Samuel Shrowder Pickles.

An investigation of West Indian satinwood (*Zanthoxylum flavum*, Vahl.; *Fagara flava*, Kr. et Urb.) has been made, the primary object of which was to determine whether it contained irritating or poisonous principles, such as have already been shown to be present in East Indian satinwood (Auld, *Trans.*, 1909, **95**, 964). The examination has shown it to contain several interesting compounds of a lactonic character, together with a number of non-crystalline resins. These include a colourless, crystalline *compound*, $C_{11}H_{10}O_3$ (m. p. 124—126°), and a pale yellow, crystalline *substance*, $C_{14}H_{12}O_3$ (m. p. 133°). Derivatives of the latter have been obtained, and its general behaviour has been studied. It yields a characteristic *dibromide*, $C_{14}H_{12}O_3Br_2$ (m. p. 125°), in which, on treatment with water, one of the bromine atoms is replaced by a hydroxyl group, giving a *compound*, $C_{14}H_{13}O_4Br$ (m. p. 168—169°). A series of resins has also been separated, as well as a further crystalline *compound* (m. p. 112—114°).

The pharmacological action of the various constituents of the wood is at present under investigation by Prof. Cash, of Aberdeen University.

129. "Optically active derivatives of *l*-methoxy- and *d*-dimethoxy-succinic acids." (Preliminary note.) By Charles Robert Young.

In continuation of previous work (Purdie and Young, *Trans.*, 1910, **97**, 1524), d-*dimethoxysuccinanilide* and d-*dimethoxysuccinanilic acid* have been prepared by the action of aniline on *d*-dimethoxysuccinic acid and its anhydride respectively. The anilide crystallises from benzene in slender needles (m. p. 137—139°), and in dilute acetone solution has $\alpha_D + 259°$. The anilic acid (m. p. 120—122°) separates from solution in acetone in small prisms; in the same solvent it has $\alpha_D + 134°$. Attempts are now being made to prepare, from the anilic acid, the corresponding anil and *iso*anil. Other active derivatives of *l*-methoxy- and *d*-dimethoxy-succinic acids of these types are under investigation with the view of studying their optical behaviour.

130. "The mechanism of the racemisation of some hydroxy-acids by heat." By Dan Ivor James and Humphrey Owen Jones.

The process of racemisation of malic acid in aqueous solutions (concentration about 8 per cent.) at about 160° has been studied,

and it has been found that racemisation takes place through the intermediate formation of fumaric acid, a change which is reversible.

The corresponding change in the case of tartaric acid would produce hydroxyfumaric acid, as suggested by Nef; this acid itself or its isomeride, oxalacetic acid, would be expected to lose carbon dioxide and yield pyruvic acid. The formation of considerable quantities of pyruvic acid has been established, and it is probable that the following changes take place:

$$\begin{matrix} CO_2H\cdot CH\cdot OH \\ \quad\quad | \\ \quad CH(OH)\cdot CO_2H \end{matrix} \rightleftharpoons \begin{matrix} CO_2H\cdot C\cdot OH \\ \quad\quad \| \\ \quad CH\cdot CO_2H \end{matrix} \rightleftharpoons \begin{matrix} CO_2H\cdot CO \\ \quad\quad | \\ \quad CH_2\cdot CO_2H \end{matrix} \longrightarrow \begin{matrix} CO_2H\cdot CO \\ \quad\quad | \\ \quad CH_3 \end{matrix} + CO_2.$$

131. "The action of sodium hypobromite on carbamide derivatives." By Frank William Linch.

The author has studied the regulated oxidation of certain carbamide derivatives by means of sodium hypobromite.

With semicarbazide the main product is *p*-urazine (yield, 80 per cent. of the theoretical) when the substances are allowed to react in the proportions indicated by the following equation:

$$2CO\langle\begin{matrix}NH\cdot NH_2\\NH_2\end{matrix} + 3NaOBr =$$

$$CO\langle\begin{matrix}NH\cdot NH\\NH\cdot NH\end{matrix}\rangle CO + N_2 + 3NaBr + 3H_2O.$$

The reaction proceeds in stages, with the intermediate formation of hydrazodicarbonamide.

p-Urazine is very sensitive towards oxidising agents, the first product being 3:6-*diketo*-1:2:3:6-*tetrahydro*-1:2:4:5-*tetrazine*,

$$CO\langle\begin{matrix}N=\!=N\\NH\cdot NH\end{matrix}\rangle CO.$$

Thiosemicarbazide and hydrazodicarbonthioamide when oxidised by hypobromite produce hydrazodicarbonthioamidesulphonic acid:

$$2SH\cdot C(:NH)\cdot NH\cdot NH_2 + 5NaOBr =$$
$$SO_3H\cdot C(:NH)\cdot NH\cdot NH\cdot C(:NH)\cdot SH + 5NaBr + 2H_2O.$$

No condensation product could be obtained from carbamide, but acetylcarbamide condenses as follows:

$$2NHAc\cdot CO\cdot NH_2 + NaOBr =$$
$$NHAc\cdot CO\cdot NH\cdot NH\cdot CO\cdot NHAc + NaBr + H_2O.$$

The author proposes to extend the investigation to other carbamide derivatives.

132. "Keto-enolic ethers and derivatives of dibenzoylmethane." By Robert Duncombe Abell.

The object of this work was to prepare ethers of the type ·C(OR):CH·CO· by the silver oxide method, which did not appear to have been applied to the keto-enolic forms of the 1 : 3-diketones.

Phenyl α-hydroxystyryl ketone, OH·CPh:CH·COPh, reacting with methyl iodide gave *αα*-dibenzoylethane, $CHBz_2·CH_3$; and with ethyl iodide gave *αα*-dibenzoylpropane, $CHBz_2·CH_2·CH_3$, and a small quantity of phenyl α-ethoxystyryl ketone, OEt·CPh:CH·COPh.

The methyl and ethyl esters of phenyl α-hydroxystyryl ketone were obtained in good yield from phenyl α-bromostyryl ketone by the action of sodium methoxide and ethoxide respectively.

Further, the sodium derivative of phenyl α-hydroxystyryl ketone reacts, under suitable conditions, with:

(1) Methyl iodide to give *αα*-dibenzoylethane.

(2) Ethyl iodide to form *αα*-dibenzoylpropane (compare Miss Smedley, *Trans.*, 1910, **97**, 1492).

(3) Ethyl iodoacetate to produce *ethyl β-dibenzoylpropionate*, $CHBz_2·CH_2·CO_2Et$.

(4) Iodine to give s-*tetrabenzoylethane*, $CHBz_2·CHBz_2$, and *dibenzoyliodomethane*, $CHBz_2I$.

(5) Benzyl iodide to form *αα-dibenzoyl-β-phenylethane*, $CHBz_2·CH_2Ph$.

(6) Benzoyl chloride to give the α- or diketo-enolic form of tribenzoylmethane, CBz_2:CPh·OH, and not the triketo-form (compare Claisen, *Annalen*, 1896, **291**, 95; Baeyer and Perkin, *Ber.*, 1883, **16**, 2135; Perkin, *Trans.*, 1885, **47**, 253).

Dibenzoyliodomethane and *αα*-dibenzoyl-β-phenylethane show feeble enolic properties.

133. "Derivatives of phenyl styryl ketone. Part I. The tautomeric forms of dibenzoylmethane." By Robert Duncombe Abell.

This revision of Wislicenus's work (*Annalen*, 1899, **308**, 219), undertaken after identifying phenyl α-ethoxystyryl ketone with "dibenzoylmethane," was continued even after the appearance of Ruhemann and Watson's paper (*Trans.*, 1904, **85**, 456) as several new results had already been obtained.

Phenyl styryl ketone combines with bromine to form two isomeric dibromides, CHPhBr·CHBr·COPh, the one melting at 158° (Claisen and Claparède, *Ber.*, 1881, **14**, 2464; Wislicenus, *loc. cit.*), the other in very small yield melting at 122° (Miss Smedley, *Proc.*,

1909, **25**, 259, gives 113°, and Pond, York, and Moore, *Amer. Chem. J.*, 1901, **23**, 789, 108—109°).

The dibromide, melting at 122°, can be obtained in 90 per cent. yield by the union of hydrogen bromide with phenyl α-bromostyryl ketone, CBrPh:CH·COPh, in carbon disulphide solution.

Phenyl α-bromostyryl ketone was prepared from the dibromide melting at 158° by the action of excess of potassium acetate in alcoholic solution (compare Wislicenus, *loc. cit.*).

According to Wislicenus, equimolecular quantities of phenyl α-bromostyryl ketone and sodium hydroxide in alcoholic solution when heated for half an hour gave a trace of phenyl α-hydroxystyryl ketone and "dibenzoylmethane," now known to be phenyl α-ethoxystyryl ketone.

The author finds that under these conditions phenyl styryl ketone is also formed.

If the same quantities of the reacting substances are heated only until the alkaline reaction disappears, phenyl α-hydroxystyryl ketone is not formed.

Wislicenus's "dibenzoylmethane" is phenyl α-ethoxystyryl ketone. The "dibenzoylmethane" of Baeyer and Perkin (*Ber.*, 1883, **16**, 2134) and of Claisen (*Ber.*, 1887, **20**, 655) is phenyl α-hydroxystyryl ketone. Dibenzoylmethane,

$$C_6H_5{\cdot}CO{\cdot}CH_2{\cdot}CO{\cdot}C_6H_5,$$

is still unknown.

134. "The interaction between di-iodoacetylene and organic sodio-derivatives." By Hugh Vernon Thompson.

Di-iodoacetylene, although a very unstable substance, resembles the metallic derivatives of acetylene in that it exhibits but little tendency to react with the ordinary organic reagents; it therefore appeared of interest to examine its behaviour towards such highly reactive compounds as sodiomalonic and sodioacetoacetic esters.

Preparation of Di-iodoacetylene.

The method for preparing di-iodoacetylene given by Dehn (*J. Amer. Chem., Soc.*, 1911, **33**, 1598) only yields satisfactory results if certain precautions not mentioned by that author are taken. It is desirable to purify the acetylene obtained by the action of water on commercial calcium carbide, by passing it through an aqueous solution of ammonium persulphate. The sodium hypochlorite solution, which is dropped into the solution of potassium iodide during the passage of the acetylene gas, should

be prepared by passing chlorine into a 10 per cent. solution of sodium hydroxide, and care must be taken that no excess of chlorine is ultimately present; if more concentrated sodium hypochlorite solutions are used, or if they contain free chlorine, the formation of di-iodoacetylene is considerably or completely inhibited. The preparation of the di-iodoacetylene should be carried out as rapidly as possible, and the precipitated substance collected immediately, washed, dried on porous earthenware, and dissolved in light petroleum; if left in contact with the mother liquor the di-iodoacetylene redissolves in part, leaving an unstable material, which explodes with violence when separated and left in contact with the air.

When the precautions indicated above are taken, the yield of crude di-iodoacetylene represents 80 to 90 per cent. of that theoretically obtainable from the amount of potassium iodide used; after purification by crystallisation from light petroleum, the yield is found to be smaller, because of the presence of a material insoluble in that solvent.

Dihydroxybutanetetracarboxylic Ester,
$CH(CO_2Et)_2 \cdot CH(OH) \cdot CH(OH) \cdot CH(CO_2Et)_2$.

One molecular proportion of di-iodoacetylene is boiled with four molecular proportions of monosodiomalonic ester in alcoholic solution for several hours on the water-bath; the reaction is performed in the dark in order to prevent decomposition of the di-iodoacetylene by light. The alcohol is then distilled off, and the residue, after addition of water, extracted with ether; the ethereal extract on evaporation yields a viscous, reddish-brown residue, which contains no halogen, and which could not be caused to crystallise. This residue is distilled under ordinary pressure, and then undergoes considerable decomposition; the distillate, however, is a colourless oil, which slowly becomes partly crystalline. The crystalline material after separation and recrystallisation from ether is obtained in small, compact, colourless crystals, which melt at 72°:

0·2062 gave 0·1250 H_2O and 0·3835 CO_2. C = 50·72; H = 6·79.
$C_{16}H_{26}O_{10}$ requires C = 50·77; H = 6·93 per cent.

1·9917 Grams dissolved in 26·45 grams of glacial acetic acid depressed the freezing point of the solvent by 0·81°. The molecular weight indicated is thus 363. 1·6347 Grams in 25·68 grams of the same solvent similarly depressed the freezing point by 0·64°, indicating a molecular weight of 390. The mean of the two determinations, namely, 376, agrees well with that corresponding with the molecular composition stated, namely, 378.

There seems little doubt that the substance is the dihydroxybutanetetracarboxylic ester which Polonowsky obtained (*Annalen*, 1888, **246**, 3) as a yellow syrup by the action of glyoxal and malonic ester in presence of zinc chloride. The formation of this product by the reaction now described may be represented by the equation:

$$C_2I_2 + 2CHNa(CO_2Et)_2 + 2H_2O = 2NaI + CH(CO_2Et)_2 \cdot CH(OH) \cdot CH(OH) \cdot CH(CO_2Et)_2.$$

On preserving the oily residue from which the above-described crystalline product had been separated, it gradually crystallised, and the crystalline compound thus obtained, after recrystallisation from ether, yielded colourless crystals melting at 47—48°. The quantity of material obtained was too small for further examination, but it is probable that the two crystalline substances melting at 72° and at 47—48° are the *cis*- and *trans*-modifications of dihydroxybutanetetracarboxylic ester.

Di-iodoacetylene reacts with sodioacetoacetic ester in alcoholic solution, and after evaporation of the alcohol, treatment of the residue with water, extraction of the aqueous solution with benzene, and evaporation of the benzene, an oily residue was obtained which was obviously a mixture; it could not be caused to crystallise, and decomposed when distilled under diminished pressure.

The attempt to cause di-iodoacetylene to condense with sodium ethoxide under various conditions led in each case to the isolation of a small yield of a dark-coloured, pungent-smelling liquid corresponding in properties with the ethyl iodo-orthoacetate,

$$CH_2I \cdot C(OEt)_3,$$

prepared by Nef (*Annalen*, 1897, **298**, 350) in the same way.

This investigation, commenced at the suggestion of Prof. Pope, will be continued.

135. "The rotatory powers of the *d*- and *l*-methylethylphenacylthetine salts." Clara Millicent Taylor.

Externally compensated methylethylphenacylthetine bromide has been prepared in quantity, and resolved into its optically active components by the aid of the corresponding salts formed with *d*-α-bromocamphor-π-sulphonic acid. An extensive series of determinations of the rotation constants for the mercury green, mercury yellow, and sodium yellow lines has been made of the salts of *d*- and *l*-methylethylphenacylthetine with the latter acid, picric acid, and styphnic acid in various solvents.

ADDITIONS TO THE LIBRARY.

I. *Donations.*

International Institute of Agriculture. Bulletin of the Bureau of Agricultural Intelligence and of Plant-diseases. 2nd year, No. 7, etc. Rome 1911+. (*References.*) From the Board of Agriculture.

Tibbles, *William.* Foods: their origin, composition and manufacture. London 1912. pp. viii+950. 18/- net. (*Recd.* 4/5/12.) From the Publishers: Messrs. Baillière, Tindall and Cox.

II. *By Purchase.*

Allen, *Alfred Henry.* Commercial organic analysis. Vol. VI. 4th edition. Edited by *W. A.* **Davis** and *Samuel S.* Sadtler. London 1912. pp. ix+726. 21/- net. (*Reference.*)

Fürth, *Otto von.* Probleme der physiologischen und pathologischen Chemie. I Band. Gewebschemie. Leipzig 1912. pp. xv+634. M. 16.—. (*Recd.* 9/5/12.)

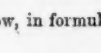
Stahl, *George Ernest.* Philosophical principles of universal chemistry: or, the foundation of a scientifical manner of inquiring into and preparing the natural and artificial bodies for the uses of life: Both in the way of experiment, and the larger way of business. Designed as a general introduction to the knowledge and practice of artificial philosophy: or, genuine chemistry in all its branches. Drawn from the *Collegium Jenense* of Dr. George Ernest Stahl by *Peter* Shaw. London 1730. pp. xxviii+424+[xxiv]. (*Reference.*)

Täuber, *Ernst,* and **Norman,** *Ragnar.* Die Derivate des Naphtalins. Berlin 1896. pp. viii+219. (*Recd.* 13/5/12.)

Thompson, *M. de Kay.* Applied electrochemistry. New York 1911. pp. xii+329. 9/- net. (*Recd.* 9/5/12.)

ERRATUM.

PROCEEDINGS, 1912.

Page 126, line 2 from below, in formula, *for*  *read* .

CANNIZZARO MEMORIAL LECTURE.

An Extra Meeting will be held on Wednesday, June 26th, at 8.30 p.m., when the Cannizzaro Memorial Lecture will be delivered by Sir William Tilden, F.R.S.

The next Ordinary Scientific Meeting will be held on **Thursday, June 6th, at 8.30** p.m., when the following papers will be communicated:

"The absorption spectra of various derivatives of naphthalene in solution and as vapours." By J. E. Purvis.

"The velocity of the hydrogen ion, and a general dissociation formula for acids." By J. Kendall.

"Chloroamino-derivatives of benzylidene-diamides." By F. D. Chattaway and A. E. Swinton.

"The refractivity of sulphur in various aliphatic compounds." By T. S. Price and D. F. Twiss.

"The conditions of isodynamic change in the aliphatic ketones. Part I. The auto-catalytic reaction between acetone and iodine." By H. M. Dawson and F. Powis.

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PROCEEDINGS

OF THE

CHEMICAL SOCIETY.

Vol. 28. No. 403.

Thursday, June 6th, 1912, at 8.30 p.m., Professor PERCY F. FRANKLAND, LL.D., F.R.S., President, in the Chair.

The PRESIDENT referred to the loss sustained by the Society in the death of M. Lecoq de Boisbaudran (elected an Honorary and Foreign Member in 1888) on May 28th.

Messrs. G. F. Wesley Martin, R. Robinson, and C. R. Wilkins were formally admitted Fellows of the Society.

Certificates were read for the first time in favour of Messrs.:

James Harry Dyson, North Lea, St. Ives Road, Skircoat Green, Halifax.

Sydney Charles Gadd, 31, St. David's Hill, Exeter.

Shigeru Komatsu, College of Science and Engineering, Kyoto Imperial University, Kyoto, Japan.

Ramni Paniker, M.A., M.Sc., c/o Messrs. Röhm & Haas, 4, Quai St. Clair, Lyons, France.

Hui Chun Tsao, B.Sc., I-Hing, Kiang-Su, China.

Of the following papers, those marked * were read:

***136. "The vapour density of ammonium nitrite."**
By Prafulla Chandra Rây, Nilratan Dhar, and Tincowry De.

The vapour density of ammonium nitrite as determined by Hofmann's method at a temperature of 66° to 78° conforms to the normal value.

***137. "Pyrogenic decompositions. Part I. Benzene." By Clarence Smith and William Lewcock.**

References to the literature show that a substance, produced by the pyrogenic decomposition of an organic compound, is obtained usually in very poor yield; for example, the best yield of diphenyl obtained by the pyrogenic decomposition of benzene is 30 per cent., recorded by Schultz (*Annalen*, 1874, **174**, 201). In the course of some experiments by one of the authors on the formation of isoprene by the pyrogenic decomposition of American turpentine, the prime importance of temperature and of duration of heating on the course of the decomposition has been made very manifest.

The experience thus gained has been applied in the pyrogenic decomposition of benzene, with the result that a continuously-working apparatus has been constructed, whereby benzene is converted into diphenyl to the extent of 70 per cent. of the theoretical yield; solid by-products are formed only in traces.

***138. "The absorption spectra of certain aromatic nitroamines and nitroamides." By Gilbert T. Morgan, Edgar Jobling, and Raymond T. F. Barnett.**

The authors have continued the spectroscopic examination of certain of the polynitrated aromatic amines (compare *Trans.*, 1911, **99**, 1945), and particularly of the dinitro-derivatives of this series.

The absorption curve of 2:6-dinitro-*p*-toluidine was found to be quite comparable with that of the tertiary amine, 2:6-dinitrodimethyl-*p*-toluidine, both bases showing very considerable suppression of the absorption band.

On comparing the absorption spectra of 3:5-dinitro-*p*-toluidine, 3:5-dinitromethyl-*p*-toluidine, and 3:5-dinitrodimethyl-*p*-toluidine, it was found that only the tertiary amine showed this suppression, both the primary and secondary bases exhibiting a well-marked absorption band, that of the former base being the more persistent.

5 : 6-Dinitro-3-amino-*o*-xylene and 3:5-dinitro-6-amino-*o*-xylene also show this suppression of the band characteristic of the majority of aromatic nitroamines, whereas 3:5-dinitro-4-amino-*o*-xylene, 3 : 4-dinitro-5-amino-*o*-xylene, and 4 : 5-dinitro-3-amino-*o*-xylene exhibit selective absorption of the normal type.

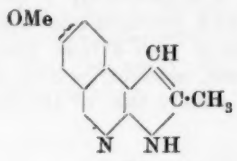
Picramide shows two well-defined absorption bands. Toluene-*p*-sulphonyl-1-nitro-β-naphthylamine (yellow) and its *N*-methyl derivative (colourless) and toluene-*p*-sulphonyl-1:6-dinitro-β-naphthylamine (colourless) do not exhibit absorption bands, either in the visible or ultra-violet regions of the spectrum.

The aromatic nitroamides exhibit absorption spectra of the same general type without absorption bands, whether the acyl groups are inorganic (NO, NO_2) or organic ($CH_3 \cdot CO$, $SO_2 \cdot C_7H_7$, etc.).

*139. "The constitution of harmine." (Preliminary note.)

By William Henry Perkin, jun., and Robert Robinson.

The authors have commenced a series of experiments on the alkaloids of *peganum harmala*, and are now in a position to suggest an expression (I) which readily affords an explanation of the reactions of harmine, and cannot be very far from the true representation of the constitution of this substance:



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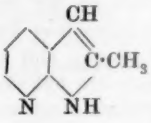


(II.)

The complete argument on which this formula is based cannot be given here, but, in addition to the facts which have already been observed by other workers, among whom O. Fischer is the most prominent, the following new observations have greatly contributed to the solution of the problem. Harmine contains an NH-group and a methyl group, which has the power of condensing with aldehydes, etc., characteristic of the methyl group in quinaldine.

Benzylideneharmine, $C_{12}H_9ON_2 \cdot CH{:}CHPh$, is obtained by boiling harmine with excess of benzaldehyde, and is purified by conversion into the sparingly soluble, bright yellow, crystalline hydrochloride.

The base separates from ethyl alcohol in pale yellow prisms melting at 191—192°, and its solutions have a most intense violet fluorescence. p-*Nitrobenzylideneharmine*,

$$C_{12}H_9ON_2 \cdot CH{:}CH \cdot C_6H_4 \cdot NO_2,$$

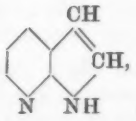
prepared by heating together harmine and *p*-nitrobenzaldehyde, separates from alcohol in red needles and melts at 266°.

C-*Benzylharmine*, $C_{12}H_9ON_2 \cdot CH_2 \cdot CH_2Ph$, obtained by the reduction of benzylideneharmine with zinc dust and acetic acid, crystallises from methyl alcohol in rectangular prisms melting at 138°.

The sparingly soluble *hydrochloride* separates from water in colourless needles which, in dilute solution, exhibit a blue fluorescence.

Nor-harminecarboxylic acid, $C_{12}H_9ON_2 \cdot CO_2H$, obtained by the oxidation of benzylideneharmine with potassium permanganate in acid solution, crystallises from acetic acid in the form of the acetate in yellow prisms. This substance loses acetic acid on heating at 100°, or better by treatment with hot water, and furnishes the free acid as a pale yellow, crystalline powder, which is almost insoluble and could not be recrystallised. Its salts, both with acids and alkalis, are crystalline and sparingly soluble in water. With ferrous sulphate it develops a brownish-red coloration, which again clearly indicates that the methyl group in harmine is in the α-position with respect to one of the nitrogen atoms.

The formula of apo*harmine* (II) deduced from that suggested for harmine (I) is that of 2-methylindole, in which one of the methine groups of the benzene ring is displaced by a nitrogen atom. Such substances have not yet been prepared (see, however, the following note), and the properties of such a fused pyridine-pyrrole nucleus are unknown. There can, however, be little doubt that the pyridine ring would greatly modify that of the pyrrole ring, and the structure,



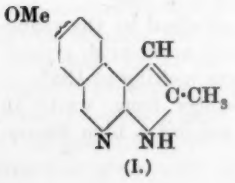
may be regarded as an independent nucleus probably presenting closer analogy to benziminazole than to either quinoline or indole.

A number of experiments are in progress, having for their object the synthesis of substances containing the pyridine and pyrrole rings fused in various positions.

*140. "The synthesis of *iso*harman." (Preliminary note.)

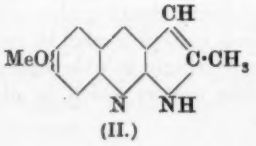
By William Henry Perkin, jun., and Robert Robinson.

An important stage in the argument developed in connexion with the constitution of harmine consists in deciding between the structures:



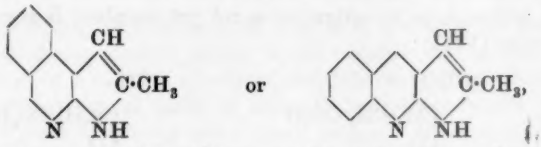
(I.)

and



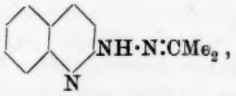
(II.)

O. Fischer (*Chem. Centr.*, 1901, **1**, 957) eliminated the methoxy-group from harmine, and obtained a base, harman, which, on the basis of the above formulæ for harmine, would have the constitution:



and in order to obtain evidence on this point the authors have synthesised the latter base. This derivative of quinoline, although very similar to harman, does not appear to be identical with it, and the *iso*quinoline structure (I) is therefore ascribed to harmine, a view which is supported by other considerations.

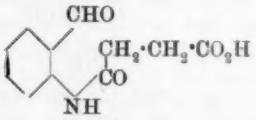
In the first experiments on the synthesis of *iso*harman, an attempt was made to apply the Fischer indole synthesis to *acetone-α-quinolylhydrazone*,



This substance, which is readily obtained from α-quinolylhydrazine and acetone, crystallises from light petroleum in pale yellow prisms melting at 102°, but indole formation could not be achieved either by heating with hydrochloric acid or zinc chloride, since hydrolysis occurred in both cases. The following indirect method of synthesis was, however, successful.

o-*Aldehydosuccinanilic acid* (III) was prepared by the condensation of *o*-aminobenzaldehyde and succinic anhydride in boiling xylene solution, and crystallises from methyl ethyl ketone in prismatic needles melting at 115°. On boiling in aqueous solution with a little more sodium hydroxide than is necessary to neutralise it, this acid undergoes internal condensation with the formation of *carbostyril-β-acetic acid* (IV), which crystallises from acetic acid in colourless needles and melts at 270°. The *methyl* ester of this acid melts at 176°, and is converted by aqueous ammonia at 100° into the *amide* (V), which crystallises from dilute acetic acid in microscopic needles and melts at 258°. When this amide is boiled with phosphoryl chloride, a remarkable reaction takes place, and *chlorono*r*iso*h*arman* (VI) is produced. This substance crystallises from dilute acetic acid in pale yellow leaflets melting at 127°, and is converted by boiling, in acetic acid solution, with potassium acetate into a neutral substance, $C_{11}H_8ON_2$, which is very sparingly soluble in organic solvents, melts at 235°, and is evidently either

*hydroxynor*iso*harman*, the lactim, or the corresponding lactam of α-aminoquinoline-β-acetic acid (VII). The solution of chloronor*iso*harman in boiling amyl ether reacts with a solution of magnesium methyl iodide in the same solvent with the formation of a base which, although its investigation is not yet complete, is regarded as iso*harman* (VIII):



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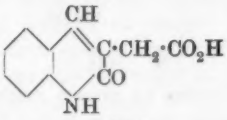

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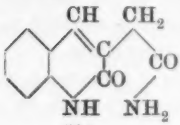

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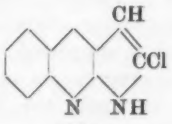

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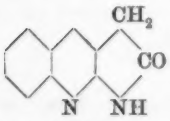

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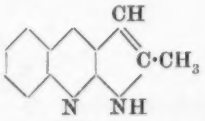


(VIII.)

iso*Harman* crystallises from methyl alcohol in leaflets, melts at about 213°, and, when heated in small quantities, sublimes with little decomposition. Its solution in sulphuric acid is colourless, and exhibits a bluish-violet fluorescence. The salts are crystalline and sparingly soluble in water; the *hydrochloride* crystallises in slender, yellow needles, and the *mercurichloride* in long needles.

The *picrate* is sparingly soluble in all solvents, but may be crystallised from methyl ethyl ketone, from which it separates in yellowish-green needles, which darken above 240° and melt and decompose at about 253°. The properties of *iso*harman are therefore strikingly similar to those of harman, which also sublimes, is readily soluble in alcohol, and dissolves in sulphuric acid to a bluish-violet, fluorescent solution. Harman melts, however, at 230°, and appears to be more soluble in hot water than *iso*harman. Moreover, aqueous solutions of the salts of harman exhibit a blue fluorescence, whereas the corresponding salts of *iso*harman do not appear to fluoresce.

***141. "Blue adsorption compounds of iodine. Part I. Starch, saponarin and cholalic acid." By George Barger and Ellen Field.**

The crystalline iodide of cholalic acid is in the main an additive compound of one atom of iodine to one molecule of the acid. By acidification of a solution of sodium cholalate containing iodine, the blue substance can be made to separate in the amorphous condition, and then it adsorbs much more iodine. Adsorption is the most important factor in the formation of the blue iodides of starch and of saponarin, and is brought about by the cation of electrolytes, the presence of which is a necessary condition for the formation of these iodides.

In all three cases the blue compounds behave like electronegative lyophobic colloids; their precipitation from solution by electrolytes depends chiefly on the valency of the cation, and follows Schulze's law; they are also precipitated by electropositive dyes. With night-blue there is a zone of optimal concentration. The lyophobic properties are only slightly marked in the case of starch iodide.

The distribution of iodine between the solution and the amorphous compounds is in all cases given by an exponential formula, which in the case of saponarin and of cholalic acid only applies over a comparatively short range of concentrations. The blue hydrosol of saponarin becomes colourless more or less abruptly at a dilution of 1:7000, corresponding with the true solubility, when the whole of the substance becomes molecular-disperse.

DISCUSSION.

Prof. MORGAN referred to the interesting point mentioned by the authors that salts of the more electropositive metals favoured the production of adsorption iodine complexes, and suggested a comparison of the behaviour of cæsium with that of barium and lanthanum, since these three elements are the most electropositive members of their respective families.

142. "The absorption spectra of various derivatives of naphthalene in solution and as vapours." By John Edward Purvis.

The absorption spectra of various α- and β-derivatives of naphthalene show that (1) the nature and type of the solution bands is controlled by the nature and type of the substituting atom or group of atoms, and (2) the vapours of these substances exhibit

bands which are comparable with the solution bands. These results were discussed with regard to the intrinsic vibratory energy of the molecules and their valencies.

143. "The velocity of the hydrogen ion and a general dissociation formula for acids." By James Kendall.

The following modification of the conductivity method has been used to determine the velocity of the hydrogen ion. The dissociation constants for weak acids at high dilutions are found to be more or less satisfactory, according to the value employed for the velocity of the hydrogen ion. With acids of a certain limited range of strength ($100k$ between 0·1 and 1·0), one particular value alone will give a satisfactory constant. Experiments have been carried out with several acids and with different samples of water, and the value finally deduced is 347·2 at 25°, with a maximum divergence of $\pm 0{\cdot}4$.

In more concentrated solutions the above acids diverge considerably from the simple dilution law. Their dissociation, however, can be exactly expressed by the formula:

$$m^2/(1-m)v = k + c(1-m)/m.$$

This formula is intermediate between those of Ostwald and van't Hoff, and has been extended to all types of acids. In all cases the agreement between the calculated and observed values is within the limits of experimental error. The above formula is therefore found to be universally applicable for acids.

144. "*N*-Chloro-derivatives of benzylidene-diamides." By Frederick Daniel Chattaway and Alan Edulf Swinton.

The benzylidene-diamides which are produced when benzaldehyde is heated with amides, although very easily hydrolysed, yield *N*-chloro-derivatives with hypochlorous acid.

From benzylidenediacetamide the dichloro-compound has been prepared, but from benzylidenedibenzamide only the monochloro-derivative has been obtained, this, on account of its sparing solubility, being easily isolated. These compounds show the usual general characteristics of chloroamino-derivatives. They are easily hydrolysed, even on long exposure at the ordinary temperature to moist air, benzaldehyde and chloro-acetamide or -benzamide being formed.

They react vigorously with warm concentrated potassium hydroxide solution, benzaldehyde, potassium carbonate, and a

primary amine being produced. Probably hydrolysis first takes place, the chloro-amide subsequently undergoing the Hofmann transformation under the influence of the alkali hydroxide.

145. "The refractivity of sulphur in various aliphatic compounds." By Thomas Slater Price and Douglas Frank Twiss.

The densities and refractive indices at 16° and 25° of the various dithio-esters previously prepared by the authors (*Trans.*, 1908, **93**, 1645; 1909, **95**, 1050) have been determined, and the corresponding molecular refractivities calculated. From the results, the atomic refractivity of sulphur has been deduced, and the values so obtained have been compared with those deduced from sulphur compounds prepared by other investigators, especial reference being made to the optical effect of auxiliary valencies (compare Eisenlohr, *Ber.*, 1911, **44**, 3188).

146. "The conditions of isodynamic change in the aliphatic ketones. Part I. The autocatalytic reaction between acetone and iodine." By Harry Medforth Dawson and Frank Powis.

If a small quantity of iodine is added to a neutral aqueous solution of acetone, the velocity with which the iodine disappears increases rapidly as the reaction proceeds, in consequence of the catalysing effect of the hydriodic acid which is formed as one of the products of the interaction. The change takes place in three stages: (*a*) $CH_3 \cdot CO \cdot CH_3 \rightleftharpoons CH_2 \cdot C(OH) \cdot CH_3$;

(*b*) $CH_2 \cdot C(OH) \cdot CH_3 + I_2 \rightleftharpoons CH_2I \cdot CI(OH) \cdot CH_3$;

and (*c*) $CH_2I \cdot CI(OH) \cdot CH_3 \rightleftharpoons CH_2I \cdot CO \cdot CH_3 + HI$, and the halogen acid which is set free in the third stage accelerates the primary isodynamic change in proportion to the quantity present. The observed progress of the change is in agreement with the assumption that the second and third stages in the reaction are of relatively high speed.

The initial velocity of the reaction in "neutral" solution appears to be much greater than can be accounted for on the basis of the original acidity, and experiments, in which small quantities of halogen acid, alkali, and sodium acetate were added to the solution at the start, seem to show that the isodynamic change is accelerated by other than acid catalysts. Although bases probably accelerate the reaction, the observed facts cannot be interpreted on the assumption that the change is conditioned by the presence of acids or bases, and it is suggested that water, independently of its ionising properties, plays the part of an accelerator.

147. "Tyrosine and its derivatives containing substituents in the benzene ring." (Preliminary note.) By Henry Stephen and Charles Weizmann.

Ethyl phthalimino-p-methoxybenzylmalonate,

$$C_6H_4\langle\begin{matrix}CO\\CO\end{matrix}\rangle N\cdot C(CH_2\cdot C_6H_4\cdot OMe)(CO_2Et)_2,$$

was prepared by heating molecular quantities of *p*-methoxybenzyl bromide and the potassium compound of ethyl phthaliminomalonate with xylene in an oil-bath at 145° for six hours. When purified by crystallisation from ethyl alcohol it melts at 83°.

Tyrosine was obtained by hydrolysis of the above compound (*a*) with concentrated aqueous sodium hydroxide, and subsequent decomposition with concentrated hydrochloric acid according to Sörensen and Andersen's method (*Zeitsch. physiol. Chem.*, 1908, **56**, 266); (*b*) with concentrated hydrochloric acid in a sealed tube at 175° for two hours.

Ethyl phthaliminopiperonylmalonate,

$$C_5H_4\langle\begin{matrix}CO\\CO\end{matrix}\rangle N\cdot C(CH_2\cdot C_6H_3\langle\begin{matrix}O\\O\end{matrix}\rangle CH_2)(CO_2Et)_2,$$

was obtained similarly by condensing piperonyl bromide and ethyl phthaliminomalonate. After recrystallisation from methyl alcohol it melts at 89°.

148. "Configuration of the stereoisomeric dibromosuccinic acids." By Alex. McKenzie.

A detailed account of work of which a preliminary note has already been published (*Proc.*, 1911, **27**, 150).

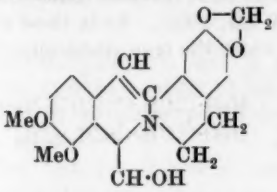
l-Dibromosuccinic acid melts at 157.—158°, and has $[\alpha]_D^{13} -148°$ in ethyl acetate solution.

The action of water on the *l*-acid and its barium and silver salts was examined.

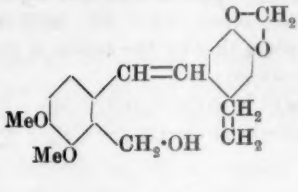
149. "The exhaustive alkylation of tetrahydroberberine." By James Wallace McDavid, William Henry Perkin, jun., and Robert Robinson.

The authors have combined tetrahydroberberine (I) successively with benzyl chloride and with methyl iodide, and, by decomposing the final product with alcoholic potassium hydroxide, have obtained

a substance (II) free from nitrogen, which they propose to name *berberilene*:



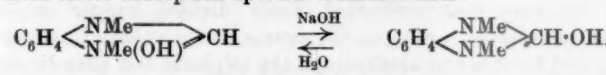
(I.)



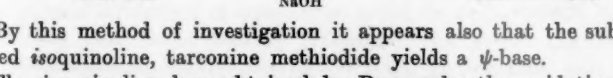
(II.)

150. "**The spectroscopic investigation of the carbinol-ammonium base isomerism. Benziminazole and *iso*quinoline derivatives.**" **By Charles Kenneth Tinkler.**

The transformation of dimethylbenziminazolium hydroxide into the corresponding carbinol, dimethylbenziminazolol, and the reverse change of carbinol into ammonium base, has been followed by ultra-violet absorption spectra measurements:



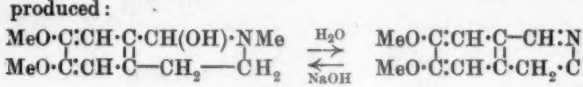
In the case of the *iso*quinoline derivatives, evidence was obtained of the conversion of 2-methyl*iso*quinolinium hydroxide into 1-hydroxy-2-methyl-1:2-dihydro*iso*quinoline by the action of sodium hydroxide and of the re-conversion of the carbinol into the ammonium base by the action of water, as recently suggested by Decker (*J. pr. Chem.*, 1911, [ii], **84**, 425):



By this method of investigation it appears also that the substituted *iso*quinoline, tarconine methiodide yields a ψ-base.

The *iso*quinoline base obtained by Pyman by the oxidation of laudanosine (*Trans.*, 1909, **95**, 1266) gives spectra in ethereal, chloroform, and sodium hydroxide solution, which are almost identical with those of the hydro-derivative and ψ-cyanide of the base, whereas in aqueous solution the spectra of the base are in very close agreement with those of the quaternary salts of the base. From the spectroscopic results obtained with this substance it would appear that the base is more correctly represented as the closed chain carbinol 1-hydroxy-6:7-dimethoxy-2-methyltetrahydro-*iso*quinoline than as the open-chain aldehyde 4:5-dimethoxy-2β-methylaminoethylbenzaldehyde, as suggested by Pyman. The base

resembles in all respects cotarnine and hydrastinine, which have previously been investigated by this method (Dobbie, Lauder, and Tinkler, *Trans.*, 1903, **83**, 598; 1904, **85**, 1005). As in these cases it appears that by the action of the water the true ammonium base is produced:



151. "Some derivatives of oxazole."
By Joseph Lister and Robert Robinson.

A number of aryl-oxazoles have been prepared by the dehydration of acylated amino-ketones in order that their fluorescence and ultra-violet absorption spectra might be investigated.

152. "Electrolytic reduction. Part VII. The catalytic action of copper." By Herbert Drake Law.

It has been discovered that finely divided copper exerts a powerful catalytic action on the course of reduction of the $\alpha\beta$-unsaturated ketones and aldehydes of the aliphatic and alicyclic series. These compounds are reduced more rapidly on copper than lead, but at the same time the latter metal combines with the partly reduced product. Copper, on the other hand, remains unattacked. The nature of the reduction reaction varies with different compounds. The attack may take place either at the carbonyl group or the unsaturated linking, or at both simultaneously. Hydrocarbons, saturated and unsaturated alcohols, saturated carbonyl compounds, and complex double molecules are formed either singly or in mixture.

153. "The two sulphides of β-naphthol."
By Cecil Reginald Crymble, Kenneth Ross and Samuel Smiles.

Henriques (*Ber.*, 1894, **27**, 2999) has shown that β-naphthol sulphide (m. p. 211°) may be converted into another sulphide of lower melting point (153°) by oxidation and subsequent reduction of the product; it has also been claimed that these sulphides are stereoisomeric. The authors have compared some reactions of these compounds, and the evidence bearing on the relationship between them was considered. The conclusion was drawn that the hypothesis of stereoisomerism is insufficient, and that the two sulphides differ in their atomic structure.

154. "α-Hydroxyhippuric acid and a new test for hippuric acid." By Paul Haas.

α-Hydroxyhippuric acid is prepared by adding bromine to a gently warmed mixture of hippuric acid and red phosphorus suspended in carbon tetrachloride, and pouring the resulting mixture into water.

The test for hippuric acid depends on its conversion into α-hydroxyhippuric acid, and the subsequent hydrolysis of this substance to benzamide and glyoxylic acid, the latter being detected by the addition of a protein solution and concentrated sulphuric acid.

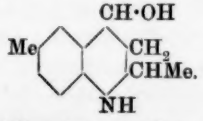
155. "The constitution of the aldol bases." By Muriel Gwendolen Edwards, Ralph Eddowes Garrod, and Humphrey Owen Jones.

The two "aldol bases," $C_{12}H_{17}ON$, prepared from *m*-4-xylidine and acetaldehyde, were studied by Jones and White (*Trans.*, 1910, **97**, 633), and it was found that they were interconvertible by the action of acids, but not by the action of heat; both gave the same benzoyl compound, the same oxime, and the same condensation product with *m*-4-xylidine, but they gave different nitroso-derivatives.

In order to arrive at a definite conclusion as to the cause of this interesting case of isomerism, the study of these compounds has been extended, and the corresponding bases obtained from *p*-toluidine, ψ-cumidine, and 3-bromo-*p*-toluidine have been examined. The clue to the solution of the problem was found when it was established that the isomeric aldol bases from *p*-toluidine gave two different monobenzoyl compounds, and that the nitroso-derivatives of these bases could be benzoylated.

It was then found that by treatment with acetyl chloride in pyridine solution diacetyl derivatives could be prepared, and in a similar way two isomeric dibenzoyl derivatives were obtained from the xylidine aldol bases.

These observations can only be accounted for on the assumption that the isomeric aldol bases are the *cis*- and *trans*-stereoisomerides of hydroxytetrahydroquinoline derivatives, for example:



in the case of the *p*-toluidine compounds.

This view explains all the known facts, and also accounts for the non-formation of similar compounds from mesidine and 5-bromo-*m*-4-xylidine.

The hydroxytetrahydroquinoline ring must be capable of fission very easily on account of the formation of the oxime, the interconversion of the isomerides by acids, and the formation of the same condensation product with xylidine in the case of the aldol bases derived from xylidine.

These condensation products, the double Schiff's bases, appear to precede the aldol bases in the interaction of acetaldehyde and amines, and as they give monobenzoyl and mononitroso-derivatives their structure is best represented as:

$$C_6H_4Me\cdot NH\cdot CHMe\cdot CH_2\cdot CH{:}N\cdot C_6H_4Me.$$

156. "Some quinoline and tetrahydroquinoline derivatives obtained from aldol bases." By Ralph Eddowes Garrod, Humphrey Owen Jones, and Percy Edwin Evans.

During the study of the constitution and properties of the "aldol bases" and their conversion under the influence of heat or of acids into quinoline and tetrahydroquinoline derivatives, the behaviour of the aldol bases derived from ψ-cumidine and 3-bromo-*p*-toluidine has been studied. The former are converted either by heat or by acids into a mixture of 2:5:6:8-tetramethylquinoline (m. p. 27—28°) and 2:5:6:8-tetramethyltetrahydroquinoline in equimolecular proportions.

When the aldol base of 3-bromo-*p*-toluidine is heated to 180—200° it changes quantitatively into the hydrobromide of 2:6-dimethylquinoline, according to the following scheme:

On boiling with acids, however, 8-bromo-2:6-dimethylquinoline (m. p. 96—97°) and 8-bromo-2:6-dimethyltetrahydroquinoline are produced, together with a small quantity of 2:6-dimethylquinoline and hydrogen bromide.

157. "The viscosity of ether–alcohol mixtures." By Frank Baker.

The viscosities of mixtures in different proportions of the following ethers and alcohols have been observed—methyl, ethyl, and propyl alcohols; ethyl ether, anisole, and phenetole.

From the results obtained, it was concluded that dissociation of the alcohol and association to an ether–alcohol complex took place in these mixtures. The bearing of these results on the viscosity of mixtures in general was discussed, and the relation $y^n = ay_1^n + (1-a)y_2^n$ shown to be empirical.

158. "Morphotropic relationships between racemic compounds and their optically active components." By George Jerusalem.

The author has examined crystallographically a number of optically active and racemic compounds, and studied the relationship observable between the crystalline structure of racemic compounds and their optically active components in these and many other cases. In all the instances examined it is found that a close morphotropic relationship exists between these substances, and that the relationship is precisely of the kind foretold by the theory of Barlow and Pope concerning the connexion of crystalline form with chemical composition and constitution.

159. "The action of sodium methoxide on 2 : 3 : 4 : 5-tetrachloropyridine. Part I." By William James Sell.

As is well known, halogen derivatives of pyridine, when heated with sodium methoxide frequently give rise to hydroxy- instead of methoxy-compounds, but no satisfactory explanation of this reaction has hitherto been offered. The author finds that when 2 : 3 : 4 : 5-tetrachloropyridine is heated to 205° with sodium methoxide in a sealed tube, a mixture of gaseous products is produced, mainly composed of methyl ether and hydrogen. It is suggested that the methoxy-derivative of pyridine first formed reacts with the excess of sodium methoxide to produce methyl ether, thus:

$$(1)\ RCl + NaOMe = ROMe + NaCl.$$
$$(2)\ ROMe + NaOMe = RONa + Me_2O,$$

and that the hydrogen is produced by the action of sodium hydroxide on the methyl alcohol present, with production of sodium formate and hydrogen.

ADDITIONS TO THE LIBRARY.

I. *Donations.*

Archbutt, *Leonard,* and **Deeley,** *R. Mountford.* Lubrication and lubricants. A treatise on the theory and practice of lubrication, and on the nature, properties, and testing of lubricants. 3rd edition. London 1912. pp. xxxvi + 599. ill. 25/- net. (*Recd.* 5/6/12.) From the Authors.

Lieben, *Adolf.* Collected papers, 1854—1910. 2 vols. (*References.*) From the Author.

MacEwan, *Peter.* The art of dispensing: a treatise on the methods and processes involved in compounding medical prescriptions. With dictionaries of abbreviations, [etc.]. 9th edition. London 1912. pp. viii + 584. ill. 6/- (*Recd.* 18/5/12.) From the Author.

III. *Pamphlets.*

Diamare, *V.* Die Biologie des Eies, als eine chemisch-anatomische Koordination. (From the *Anat. Anzeiger,* 1911, **40.**)

Emde, *Hermann.* Spaltung des Phenäthyl-trimethyl-ammoniums. (From the *Apoth. Zeit.,* 1912, **27.**)

Filippi, *Eduardo.* Contegno farmacologico di alcuni preparati mercuriali insolubili. I. (From the *Arch. Farm. Sper.,* 1911, **12.**)

—— Di alcune combinazioni e preparazioni iodiche usate comunemente in terapia. (From the *Arch. Farm. Sper.,* 1911, **12.**)

—— Proprietà farmacologiche dell' Adalina (Bromodietilacetilcarbammide). (From the *Arch. Farm. Sper.,* 1911, **12.**)

Luzzatto, *R.,* and **Satta,** *G.* Intorno al comportamento nell' organismo animale dell' orto-jodanisolo. (From the *Arch. Farm. Sper.,* 1911, **11.**)

Mameli, *Efisio,* and **Patta,** *Aldo.* Dell' acido para-iodiofenilarsinico e di alcuni suoi derivati. II. and III. (From the *Arch. Farm. Sper.,* 1911, **11** and **12.**)

Miyake, *K.* Ueber die Nicht-Eiweiss-Stickstoff Bestandteile der Schösslinge von Sasa paniculata. (From the *J. Coll. Agric. Tohoku Imp. Univ.,* 1911, **4.**)

Miyake, *K.,* and **Tadokoro,** *T.* On the carbohydrates of the shoots of the Sasa paniculata. (From the *J. Coll. Agric. Tohoku Imp. Univ.,* 1911, **4.**)

Oshima, *K.,* and **Tadokoro,** *T.* On the carbohydrate group in Yam Mucin. (From the *J. Coll. Agric. Tohoku Imp. Univ.,* 1911, **4.**)

CANNIZZARO MEMORIAL LECTURE.

An Extra Meeting will be held on Wednesday, June 26th, at 8.30 p.m., when the Cannizzaro Memorial Lecture will be delivered by Sir William Tilden, F.R.S.

The next Ordinary Scientific Meeting will be held on **Thursday**, June **20th**, 1912, at **8.30** p.m., when there will be a ballot for the election of Fellows, and the following papers will be communicated:

"The formation of neon as a product of radioactive change." By Sir William Ramsay.

"The colour intensity of copper salts." By S. U. Pickering.

"Nitrites of the mercurialkyl- and mercurialkylaryl-ammonium series. Part II." By P. C. Rây, N. Dhar, and T. De.

"An analysis of the waters of the thermal springs of Bath." By I. Masson and Sir William Ramsay.

"Studies on certain aliphatic hydroxy-acids." By H. J. H. Fenton and W. A. R. Wilks.

"Formation of seven- and eight-membered rings from 2:2′-ditolyl." By J. Kenner.

"Studies of dynamic isomerism. Part XIII. Camphorcarboxylamide and camphorcarboxypiperidide. An illustration of Barlow and Pope's hypothesis." By W. H. Glover and T. M. Lowry.

"Studies of dynamic isomerism. Part XIV. Successive isomeric changes in camphorcarboxylamide and camphorcarboxypiperidide." By T. M. Lowry and W. H. Glover.

"Contributions to the chemistry of the terpenes. Part XIII. The preparation of pure bornylene." By G. G. Henderson and W. Caw.

CERTIFICATES OF CANDIDATES FOR ELECTION AT THE NEXT BALLOT.

N.B.—The names of thos who sign from "General Knowledge" are printed in *italics*.

The following Candidates have been proposed for election. A ballot will be held on June 20th, 1912.

Allcock, Thomas,

The Rookery, Pye Bridge, Alfreton.

Analytical Chemist. Was seven years under Mr. C. H. Ridsdale, F.I.C., F.C.S., at the North Eastern Steelworks, Middlesbro', and I am now in charge of the Laboratory at the Alfreton Ironworks, Derbyshire.

C. H. Ridsdale.	R. B. Wight.
J. E. Stead.	*H. Frankland.*
N. D. Ridsdale.	*Ernest W. Jackson.*

Barnett, Raymond Theodore Fred,

19, Merton Street, Swindon, Wilts.

Student (National Scholar, Royal College of Science, S.W.). Associate of the Royal College of Science (Chemistry); B.Sc. London (Second Class Honours in Chemistry); Post-graduate work in Organic Chemistry at the Royal College of Science since October, 1911.

M. O. Forster.	G. T. Morgan.
James C. Philip.	Chapman Jones.

A. A. Eldridge.

Bews, Charles James Vinall,

52, Sir John's Road, Selly Park, Birmingham.

Assistant Master. Bachelor of Science (Honours Chemistry); Associate of Royal College of Science (Chemistry); Teacher of Chemistry (1906–1912).

M. O. Forster.	James C. Philip.
Chapman Jones.	G. T. Morgan.

Lionel M. Jones.

Birks, Cyril Douglas,

Cobnar Gardens, Woodseats, Sheffield.

Gas Representative and Chemist to Messrs. Hattersley & Davidson, Ltd., Sheffield. Four years Assistant Chemist to the Bradford

Corporation Gas Department; First Class Honoursman in Gas Engineering and Gas Supply (City and Guilds), also First Class Second Stage Practical Chemistry (Science and Art). Am desirous of keeping in touch with current chemical literature.

Harold G. Colman. Walter M. Gardner.
Julius B. Cohen. Barker North.
Wm. Cranfield. *G. W. Slatter.*

Bowater, William Henry,
Charters Towers.

Senior Demonstrator in Chemistry, Assaying, and Metallurgy, School of Mines, Charters Towers. I became a Student at the above School in February, 1907. Have had ten years Practical Mining experience, having been Underground Manager of the Ruby P.C.G.M. Co. on this field. In September, 1909, I resigned the above to take up the position of Manager of the Venus Cyanide Works. I obtained the Diploma of Metallurgical Chemist and Assayer at this School in 1910. Resigned the management of the Venus Cyanide Works to take up the position of Junior Demonstrator in Chemistry and Assaying at this School in April, 1910. Was promoted to the position of Senior Demonstrator in Chemistry, Assaying, and Metallurgy in September, 1911, a position which I now hold.

George J. Saunders. Basil Turner.
J. A. Schofield. J. A. Hughes.
Charles Walker.

Brindle, Harry,
225A and 227A, Oxford Road, Manchester.

Principal of the Manchester College of Pharmacy. Pharmaceutical Chemist (successful at all the Pharmaceutical examinations at the first attempt). Fairchild Scholar, and prizewinner in several analytical competitions. Demonstrator at Manchester College of Pharmacy, 1910–1911, superintending practical work in the laboratories. Now co-principal.

Chas. Turner. Robert Pettigrew.
Henry Garnett. E. F. Harrison.
James Porter Shenton.

Campbell, Alfred Varlow,
Rothamsted Experimental Station, Harpenden.

Agricultural Chemist. Student in Chemical Department, Central Technical College, London, 1906–1909. Diploma of A.C.G.I. Carrying out research at Rothamsted Experimental Station, 1909–1911; Chemist to Œcological Committee; Tobacco Investigator

to the Development Commission. Published work: "Carbohydrates in the Mangold Leaf" (*J. Agric. Science*, 1912, Vol. IV, Part 3).

A. D. Hall. E. J. Russell.
H. B. Hutchinson. Henry E. Armstrong.
W. A. Davis. N. H. J. Miller.
J. Vargas Eyre.

Campbell, Arthur Fred,

Westwood, Middleton, Manchester.

Research Chemist. Research Chemist, Messrs. Hardman & Holden, Ltd., Manufacturing Chemists. Three years Student in the Chemical Laboratories of the University of Manchester; one year Research Student; B.Sc. Honours in Chemistry; M.Sc. Publications with Dr. J. F. Thorpe in the *Transactions*, 1910, **97**, 118 and 248. Two years Research Chemist, Messrs. Burt, Boulton & Haywood, Ltd., Tar Distillers, etc.

Harold B. Dixon. W. H. Perkin.
Ch. Weizmann. E. C. Edgar.
A. Lapworth. Norman Smith.
Alfred Holt. Jocelyn Thorpe.

Chatterji, Bamacharan,

4, Cornwallis Square, Calcutta.

Assistant Professor of Chemistry, Scottish Churches College, 4, Cornwallis Square, Calcutta. B.A. (University of Allahabad); M.A. (University of Calcutta). Sometime Tikari Professor of Chemistry, B.N. College, Bankipur. Author of a Practical Chemistry for Intermediate Students.

J. Watt. P. C. Rây.
B. C. Dutt. *Puñchânan Neogi.*
Jyotibhushan Bhaduri.

Cheshire, Frank Lothian

Mines Department, Brisbane, Queensland, Australia.

A Staff Officer, Mines Department, Brisbane, Queensland. Graduated at Charters Towers School of Mines in Metallurgical Chemistry and Assaying after a three years' Course (1905–1907), for which received School Diploma (under Queensland Mines Department). Appointed Junior Demonstrator in Metallurgical Chemistry and Assaying at Charters Towers School of Mines in September, 1907, and remained in that position till April, 1910, when transferred to the Staff of the Mines Department, Brisbane, which position he still holds.

George J. Saunders. Charles Walker.
Joseph A. Hughes. Basil Turner.
J. A. Schofield.

Clark, Leslie Melville,

3, Harley Road, Hampstead, N.W.

Works Chemist. Received the Certificate of Finsbury Technical College, 1910. Senior Student, 1911–1912. Intermediate A.I.C., April, 1912.

R. Meldola. Reginald F. Easton.
B. H. Buttle. G. Cecil Jones.
Harley F. Knight.

Das, Bhupati Nath,

Wari, Dacca, Eastern Bengal.

Professor of Inorganic and Physical Chemistry, Government College, Dacca. M.A. in Chemistry (Calcutta University, 1890); B.Sc. (Lond.) with Honours in Chemistry, 1895. Worked under Prof. Carey-Foster, Prof. Sir William Ramsay, and Prof. J. Norman Collie at University College, London, from 1892 to 1896. Professor of Physics and Chemistry in First-grade Government Colleges in Bengal since 1897.

E. R. Watson. William Ramsay.
P. C. Rây. N. T. M. Wilsmore.
J. N. Collie.

Davys, Gerard Irvine,

India. (Present address while on leave, Beechview, Kidbrook Grove, Blackheath, London, S.E.)

Captain, Indian Medical Service. B.A., M.D., B.Ch., D.P.H. Honoursman and First Prizeman University Dublin in Physiological Chemistry. Two years special work on the Chemistry of Vermin Destroyers for the Punjab Government. Eight months work at the Chemistry of Food and Drugs, etc., for the D.P.H. Examination. Obtained Diploma of Public Health (Dublin) with Honours in Chemistry, etc.

David Sommerville. Rhys P. Charles.
Henry L. Smith. R. Meldola.
Henry Robert Lyell.

Dieffenthaller, George Cruden,

7, Darcueil Lane, Belmont, Port of Spain.

Pharmacist, Trinidad. Educated at St. Mary's College, Trinidad, and passed the Cambridge Local Examinations. Studied Practical and Theoretical Chemistry under the late Professor J. McCarthy, Government Analyst, and passed the examination in this Science. President of the Pharmaceutical Society of Trinidad. Contributed

several papers and lectures on Pharmaceutical subjects, including Native Medicinal Plants, etc., to the Pharmaceutical Society.

A. E. Collens. E. J. Millard.
John C. Hewlett. *C. Harold Wright.*
Joseph de Verteuil.

Fergusson, Donald MacEachern,
c/o Acadia Sugar Refining Co., Ltd., Halifax, N.S.

Analytical Chemist. As Student: First Class Honours Theoretical and Practical Chemistry, Science and Art Department Examinations. Certificates: Organic Chemistry, Magnetism and Electricity, etc., Science and Art Department Examinations. Took regular courses in Bacteriology, Biology, Physical Chemistry, Dalhousie University, Halifax. As Teacher: Assistant Demonstrator, Greenock Science Classes. As Analyst: Public Analysts Laboratory, Greenock, six years. Chemist: Halifax Sugar Refining Co., Ltd.; Acadia Sugar Refining, Co., Ltd., for past ten years, being chief chemist. Member Society of Chemistry Industry, 1902; Member of American Chemical Society, 1904; Vice-President, Nova Scotia Institute of Science, 1910–11, 1911–12.

H. Jermain Creighton. John Wm. Biggart.
Jno. Peden. Angus Smith.
Thomas S. Dick.

Foster, Alfred George Ernest,
103, St. Mark's Road, Bristol.

Chemist. Member of the Pharmaceutical Society. Late Demonstrator in Practical Chemistry at Westminster College of Pharmacy. Silver medallist, Chemistry; Bronze medallist, Pharmacy. My reasons for desiring the Fellowship of the Chemical Society have their birth in the wish to be in closer intimacy with research work, and the proceedings of the Chemical Society generally.

Wm. Berry. *H. Wippell Gadd.*
H. Sampson Wills. *Albert E. Bell.*
Stiles W. G. Rich. *Ernest H. Cook.*

Gajjar, Madanlal Jekisandas, M.A.,
Heira House, Girgaum, Bombay.

Assistant Director of Prof. T. K. Gajjar's Technico-Chemical Laboratory (recognised by the Bombay University for post-graduate studies in Chemistry). Professor of Chemistry from the year 1907; lecturing to M.A. and other students of the T. C. Laboratory, after passing the M.A. Exam. (Bombay University) with Chemistry (Second

Class). Head of the Analytical and Consultation Dept. of the Laboratory, and Managing Director of the Ionic Pharmacy.

T. K. Gajjar. A. R. Normand.
E. M. Modi. Kapibram H. Vakil.
G. R. Rele.

Gallogly, Michael Francis,
St. Colman's College, Newry.

Clergyman, and Professor of Mathematics, Experimental Physics, and Chemistry. B.A. (Honours), R.U.I. Ten years' experience in teaching above subjects (being for more than eight years in connexion with the Department of Technical Instruction, Ireland). Advanced First Class Certificates in Organic Chemistry, Inorganic Chemistry (Theoretical and Practical), also in Heat, Light, Sound, Magnetism and Electricity, Theoretical Mechanics (from Board of Education).

Emil A. Werner. *Wm. C. Ramsden.*
Wm. Caldwell. *A. O'Farrelly.*
R. Wright. *Hans Krall.*
Sydney Young.

Glegg, Robert,
19, Mount Street, Aberdeen.

Analytical Chemist, and Assistant Lecturer in Agricultural Chemistry (University of Aberdeen and Aberdeen College of Agriculture). Teacher of Chemistry and Physics, Aberdeen School of Pharmacy, 1894–95. Bachelor of Science, Aberdeen University, 1898. Member, Society of Chemical Industry, 1901. Assoc. Institute of Chemistry, 1902; Fellow, 1905. Member, Soc. of Public Analysts, 1908. From July, 1898, to October, 1901, Private Assistant to Mr. Jas. Hendrick, B.Sc., F.I.C., Lecturer in Agricultural Chemistry, Aberdeen University, and Public Analyst. From October, 1901, to February, 1905, Assist. in Laboratory of late Prof. J. Campbell Brown, Public Analyst, Liverpool. Since then Chief Assistant to Mr. Hendrick aforesaid. Work partly in teaching Agricultural Chemistry, partly in analysis of manures, feeding-stuffs, soils, waters, foods and drugs, and general analytical work.

F. R. Japp. Alexander Lauder.
James Hendrick. William Maitland.
A. N. Meldrum. *J. Bruce Miller.*

Harding, Leonard,
Fern Lea, Russell Street, Eccles.

Chief Chemist to British Engine Boiler and Electrical Insurance Co., Ltd., 12, King Street, Manchester. Analytical Chemist (Technical). Author of original article on "Suction Gas and Low Insulation,"

published in *Electrical Review*. Original work on Selenium Photometer.

B. Prentice. E. Green.
J. R. Appleyard. E. Clark.

Jas. W. McMyn.

Hartley, Harold,

Fernbank, Little Switzerland, Douglas, Isle of Man.

Chief Chemist, Richmond Gas Stove and Meter Co., Ltd., Warrington. 1907, B.Sc., First Class Honours in Chemistry, Manchester University; 1908, M.Sc., Manchester University; 1907–9, Gartside Scholar, Manchester University; 1909–12, Gas Institution Research Fellow, Leeds University; 1912, Appointed Chief Chemist, Richmond Gas Stove Co.; 1909–12, "Investigation of Function of Surfaces in Promoting Gaseous Reactions" (in conjunction with Prof. Bone—unpublished).

William A. Bone. Harold B. Dixon.
Arthur Smithells. Alfred Holt.
Henry R. Procter. E. C. Edgar.

Hatherly, Henry Medley,

14, Stackpool Road, Southville, Bristol.

Analytical Chemist. Twelve years with Dr. Ernest H. Cook at the Clifton Laboratory, Bristol. Five years as Articled Apprentice and seven years as Assistant.

Ernest H. Cook. *Francis Francis.*
John M. H. Munro. *James W. McBain.*
Jas. Steger. *F. W. Rixon.*

Henius, Max.

1135, Fullerton Avenue, Chicago, Ill., U.S.A.

Secretary, Wahl-Henius Institute of Fermentology, Chicago. Ph.D., University Marburg, Germany; Instructor Brewery practice and Mathematics for twenty years; co-author of American Handy Book on Brewing, Malting, etc.

Charles B. Davis. A. Chaston Chapman.
Horace T. Brown. Adrian J. Brown.

Arthur R. Ling.

Heron, Harold,

110, Fenchurch Street, London, E.C.

Brewer's Analyst and Consulting Chemist. I have been occupied for thirteen years as chemist and analyst as under: Five years as Assistant to John Heron, F.I.C., F.C.S., 110, Fenchurch Street, London, E.C. Five years as Chemist to Messrs. Fowler, Ltd., Sugar

Refiners, London. Two years associated in partnership with John Heron, F.I.C., F.C.S.

John Heron. A. Chaston Chapman.
Otto Hehner. Charles A. Keane.
Horace T. Brown.

Holden, Edmund Haworth,
25, Curwen Street, Workington, Cumberland.

Science Master, Workington Secondary School, and Lecturer in Chemistry and Metallurgy, Technical School, Workington, from October 1st, 1909, to the present time. Assistant, Wigan Mining and Technical College, January, 1908, to September, 1909. Graduated B.Sc. (Vict. Univ. of Manchester, 1905, Chemistry and Physics); M.Sc., Vict. (1907, in Chemistry).

Harold B. Dixon. Norman Smith.
W. H. Perkin R. Robinson.
E. C. Edgar. *A. Lapworth.*

James, Edward Lewis,
Holly Lodge, Larkhall Rise, Clapham, S.W.

Chemistry Master, Sir Walter St. John's Secondary School, Battersea. To keep up to date in chemical knowledge.

Alex. McKenzie. G. W. Clough.
Leonard Temple Thorne. F. Barrow.
E. Haynes Jeffers. Geoffrey Martin.
John Wilson. *Raphael Meldola.*
W. T. Lattey.

James, Edwin Oliver (Rev.),
The Curatage, Low Moor, Yorks.

Clerk in Holy Orders. For sometime Assistant Master and Science Lecturer. Science student at University College, London. Author of "God's Eight Days of Creation." Work on Chemistry, and thesis on "Chemistry of Life," in course of preparation.

William Ramsay. William Briggs.
J. W. Shepherd. *J. C. Mascarenhas.*
Samuel F. Stell.

Jewell, William,
44, Highfield Road, Dartford, Kent.

Chemist. Associate of the Institute of Chemistry. Demonstrator at the Technical College, Finsbury; and at present engaged as Chemist at Messrs. Burroughs Wellcome & Co., Dartford.

Raphael Meldola. Frank Lee Pyman.
Francis H. Carr. W. H. Taylor.
Frederick B. Power.

Keenan, Thomas John,

751, East Nineteenth Street, Brooklyn, N.Y., U.S.A.

Managing Editor of *Paper*, New York. Author of numerous papers and pamphlets on pharmaceutical chemistry, toxicology, new remedies, radioactive bodies, antiseptics, disinfectants, materia medica (organic and inorganic) in the *Pharmaceutical Record*, 1890–1892, and *American Druggist*, 1892–1911. At present engaged in work as paper technologist and cellulose chemist. Editing the weekly journal of paper technology, "*Paper*."

Chas. Baskerville. Peter MacEwan.
Fred. W. Fletcher. William Mair.
Thos. Stephenson.

Kuntzen, Harold Eric,

Doric Lodge, Clapton Common, London, N.

Chemist. Co-author with Prof. R. Meldola, F.R.S., of the following: "Syntheses with Phenol Derivatives, Part III and Part IV." "Salts and Ethers of 2 : 3 : 5-Trinitro-4-acetylaminophenol, etc."

R. Meldola. G. T. Morgan.
John Joseph Eastick. M. O. Forster.
B. E. R. Newlands.

Langton, Harold McKee,

80, Kingston Road, Ilford, Essex.

Science Teacher under the London County Council. B.Sc. (London). Science Teacher (Chemistry) for one year under London County Council. Lecturer and Demonstrator for one year in Chemistry at East Ham Technical College. Two and a-half years' experience in research work under Dr. A. E. Dunstan.

A. E. Dunstan. F. B. Thole.
E. D. Griffiths. W. H. Barker.
R. W. Wilson.

Macdonald, James Leslie Auld,

13, Howard Place, St. Andrews, Fife, N.B.

Bachelor of Science (St. Andrews). Chemical Research Student, St. Andrews University. Formerly Assistant Manager and Chemist to the Oak Extract Company, Ltd. (of London) at their factory in Zupanjé, Slavonia, Austria-Hungary. At present engaged upon a research on the "Nature of the Condensation of Acetone with Glycerine and other Polyhydroxy-compounds" in the Chemical Research Laboratory, St. Andrews University.

J. C. Irvine. Thomas Purdie.
William S. Denham. G. Druce Lander.
Arthur W. Crossley.

Masani, Nadirshaw Adarji,
Baroda Camp, India.

Professor of Chemistry, Baroda College. Head of the Department of Chemistry, Baroda College. Master of Arts and Bachelor of Science of the Bombay University.

T. K. Gajjar. Alex. R. Normand.
E. M. Modi. *G. R. Rele.*
Kapibram H. Vakil.

Meadon, Percival Edward,
6, Stanley Road, Oxford.

Assistant Education Secretary, Oxford County Council. B.A. Oxon. (Chemistry), St. John's College. Formerly Teacher, now Assistant Education Secretary.

W. W. Fisher. P. Elford.
A. F. Walden. J. E. Marsh.
B. Lambert.

Meister, Frederick James,
1, Stanley Terrace, Alva.

Analyst. I studied chemistry under the late Mr. Aitken, lecturer in Edinburgh University and Royal Dick College, for a period of some six years, during which time I was actively engaged in analytical work, practical and theoretical chemistry, etc. I assisted Mr. Aitken in his lectures and practical classes both in the Dick College and University, also taking classes in botany and zoology, bacteriology, etc. I left Mr. Aitken to go as a chemist to Messrs. the Distillers Co., Ltd., Edinburgh, with whom I have been some twelve years, where I hold the position of chief chemist and director of laboratory. I have spent all my time in the fermentation industries, also having gone abroad several times to enquire into Continental conditions, etc., of the fermentation industries.

Stevenson Macadam. G. H. Gemmell.
J. Wyclif Black. J. Falconer King.
A. Scott Dodd.

Menzies, Robert Charles,
27, Cluny Drive, Edinburgh.

Student of Chemistry. Studied chemistry in Cambridge for four terms under Dr. H. J. H. Fenton, F.R.S. Since 1910 have been studying for the degree of B.Sc. in the University of St. Andrews, and now desire to become a Fellow of the Society, as I hope to commence research work next term.

J. C. Irvine. Hugh Marshall.
William S. Denham. G. Druce Lander.
Thomas Purdie.

Morgan, Sidney,

Rubber Growers' Association Laboratory, Pataling, Kuala Lumpur, Fed. Malay States.

Analytical Chemist. Assistant to Messrs. Clayton Beadle and Stevens, Kuala Lumpur, F.M.S. Associate of Royal College of Science.

Henry P. Stevens.	M. O. Forster.
Clayton Beadle.	G. T. Morgan.
James C. Philip.	W. Godden.

A. Clayton.

Pearson, George Ernest,

Prospect Cottage, Sutton, near Hounslow.

Works Chemist. Pharmaceutical Chemist. Member, Pharmaceutical Society; Chief Chemist to Baiss Bros. & Stevenson, Ltd.

John C. Umney.	*C. T. Bennett.*
Peter MacEwan.	*Walter F. Reid.*
Thomas Tyrer.	*N. H. Martin.*

W. L. Howie.

Rideal, Eric Keightley,

28, Victoria Street, S.W.

Chemical Student in the Research Laboratory of Electrochemistry at Aachen, Germany. B.A. Cantab (Honours in Chemistry).

E. Grant Hooper.	W. R. Hodgkinson.
Thos. Tyrer.	H. J. H. Fenton.

H. O. Jones.

Shaw, William Daveridge Hamilton,

c/o The Coppée Coke Oven Co., Ltd., King's House, Kingsway, W.C.

Technical Chemist. Student (Inorganic Chemistry, Organic Chemistry, Metallurgy) at University College, Cardiff, 1899–1903. Lecturer in Chemistry at Rutherford College, Newcastle-on-Tyne, until April, 1912. Now as above. B.Sc. Diploma in Metallurgy (Wales).

Claude M. Thompson.	Clarence A. Seyler.
E. P. Perman.	John W. Bevan.

A. A. Read.

Thévenaz, William,

48, Grey Street, Hull.

Manufacturing Chemist. Chimiste diplômé and docteur-ès-Sciences physiques et chimiques of the University of Geneva (Switzerland).

Paul Haas.	F. N. Kay Menzies.
R. H. A. Plimmer.	*Samuel Smiles.*

Arthur W. Crossley.

Thomas, William Leonard,
10, Victor Road, Bradford.

Analytical Chemist. Bradford Technical College, 1905–1906. Technical Chemist, Woolcombers, Ltd., Bradford.

Walter Leach.	A. Battye Knaggs.
Walter M. Gardner.	*B. A. Burrell.*
Barker North.	*T. Fairley.*

Waters, Percy Wharton,
Glenbervie, Melrose Avenue, Brooklands, Cheshire.

Analytical Chemist. Studied Chemistry for five years, and two years Assistant to Lester Reed, Esq., F.I.C., Borough Analyst for Croydon.

Lester Reed.	Cecil H. Cribb.
A. J. de Hailes.	*Walter Tong.*

Samuel Rideal.

Williams, George Mason,
17, Springcroft Avenue, Muswell Hill, N.

Manufacturing Chemist. Late pupil of Mr. P. A. Ellis Richards in Chemistry at Charing Cross Hospital Medical School. I am making a speciality of Lecithin and its preparations, and am most anxious to become a Fellow of the Chemical Society in order that I can attend the Lectures and have the use of Library, etc.

Ernest J. Parry.	P. A. Ellis Richards.
Edwin Harrison.	*C. T. Bennett.*

John. C. Umney.

The following Certificates have been authorised by the Council for presentation to ballot under Bye-law I (3):

Dutta, Jatindra Mohan,
Dacca, 145, Laksmibazar (E. Bengal, India).

Research Scholar, Dacca College, Chemical Laboratory, Dacca. M.A. of the Calcutta University, Bengal, India. Special Research Scholar of the Government of Eastern Bengal and Assam, India. Jointly written the following papers: (1) "The Relation between the Chemical Constitution of Monazo-dyes and their Fastness to Light" (*Abst. Pros. C. S.*, vol. 25, 1909, p. 290; *J. Soc. Dyers and Col.*, 26, 237–8). (2) "The Relation between the Chemical Constitution of Monazo-dyes and Fastness to Light and Other Agencies" (*J.S.C.I.*, Jan. 15, 1911, p. 9). (3) "On Knecht's Process for Estimating

Azo-dyes on Textile Fabrics." (4) "The Reaction between Permanganate of Potash and Manganese Sulphate in Acid Solution" (*Abst. Pros. C. S.*, vol. 25, 1909, p. 249; published in *Zeitschrift für anorganische Chemie*, June 14, 1910). (5) "The Relation between Chemical Constitution and Fastness to Light and Other Agencies of Polyhydroxybenzophenone Dyes" (*J.S.C.I.*, Feb. 28, 1911). (6) "Some Hydroxy-ketonic Dyes" (submitted for publication to the Chemical Society, London).

E. R. Watson.

Sircar, Anakul Chandra,

Chemical Laboratory, Dacca College, Dacca, East Bengal, India.

Research Student, Dacca College, Dacca, India. Second Class M.A. in Chemistry, Calcutta University, Eastern Bengal, and Assam Govt. Research Scholar, 1909–1911. Prem Chaud Roy Chaud Research Scholar (Calcutta University), 1910. Mout Gold Medallist (Calcutta University), 1910. Research Student, Dacca College. Joint author of the following original papers: (1) "The Relation between the Chemical Constitution and Fastness of Azo-dyes to Light" (*Chem. Soc. Proc.*, 1909, **25**, 224; *J. Soc. Dyers and Colourists*, **26**, 237–38). (2) "The Relation between the Chemical Constitution of Monazo-dyes and Their Fastness to Light and Other Agencies" (*Journal of the Soc. of Chem. Ind.*, Jan. 16, 1911). (3) "The Reaction between Permanganate of Potash and Manganese Sulphate in Acid Solution" (*Zeitschrift für anorganische Chemie*, June 14, 1910). (4) "Azo-salicylic and Azo-oxynaphthoic Acid Dyes" (has been sent to the Chemical Society). (5) "On Knecht's Process for Estimating Azo-dyes in Textile Fabrics."

E. R. Watson.

R. CLAY AND SONS, LTD., BRUNSWICK ST., STAMFORD ST., S.E., AND BUNGAY, SUFFOLK.

[*Issued* 30/7/12

PROCEEDINGS

OF THE

CHEMICAL SOCIETY.

Vol. 28. No. 404.

Thursday, June 20th, 1912, at 8.30 p.m., Dr. M. Onslow Forster, F.R.S., Vice-President, in the Chair.

Messrs. Bertram Lambert, Edgar A. Rayner, and J. W. Patterson were formally admitted Fellows of the Society.

Certificates were read for the first time in favour of Messrs.:

Edwin John Amies, B.Sc., 10, Salisbury Road, Thorpe Hamlet, Norwich.
William Llewelyn Bailey, Central Buildings, Matlock.
Edmund Arthur Buckle, Beech Villa, Guest Road, Prestwich, Manchester.
Ridsdale Ellis, B.Sc., 20, Queen's Square, Bloomsbury, W.C.
Arthur James Hale, B.Sc., 53, Gowrie Road, Lavender Hill, S.W.
Archie Haydon, 55, Grove Lane, Kingston-on-Thames, Surrey.
Edward Hope, M.Sc., Lockingstoops, Lowton, Newton-le-Willows.
Herbert Carr Roper, 42, Cavendish Place, Newcastle-on-Tyne.

A Certificate has been authorised by the Council for presentation to ballot under Bye-law I (3) in favour of Mr. Francis Maxwell, 77, Lawrie Park Road, Sydenham, and Credit Foncier, Mauritius.

A Ballot for the election of Fellows was held, and the following were subsequently declared duly elected:

Thomas Allcock.
Raymond Theodore Fred Barnett, B.Sc.
Charles James Vinall Bews, B.Sc.
Cyril Douglas Birks.
William Henry Bowater.
Harry Brindle.
Alfred Varlow Campbell.
Arthur Fred Campbell, M.Sc.
Bamacharan Chatterji, M.A.
Frank Lothian Cheshire.
Leslie Melville Clark.
Bhupati Nath Das, M.A., B.Sc.
Gerard Irvine Davys, B.A., M.D., B.Ch., D.P.H.
George Cruden Dieffenthaller.
Jatindra Mohan Dutta, M.A.
Donald MacEachern Fergusson.
Alfred George Ernest Foster.
Madanlal Jekisandas Gajjar, M.A.
Michael Francis Gallogly, B.A.
Robert Glegg, B.Sc.
Leonard Harding.
Harold Hartley, M.Sc.
Henry Medley Hatherly.
Max Henius, Ph.D.
Harold Heron.
Edmund Haworth Holden, M.Sc.
Edward Lewis James.
Edwin Oliver James.
William Jewell.
Thomas John Keenan.
Harold Eric Kuntzen.
Harold McKee Langton, B.Sc.
James Leslie Auld Macdonald, B.Sc.
Nadirshaw Adarji Masani, M.A., B.Sc.
Percival Edward Meadon, B.A.
Frederick James Meister.
Robert Charles Menzies.
Sidney Morgan.
George Ernest Pearson.
Eric Keightley Rideal, B.A.
William Daveridge Hamilton Shaw, B.Sc.
Anakul Chandra Sircar, M.A.
William Thévenaz, D. ès Sc.
William Leonard Thomas.
Percy Wharton Waters.
George Mason Williams.

Of the following papers, those marked * were read:

***160. "The formation of neon as a product of radioactive change." By Sir William Ramsay, K.C.B.**

The discovery that there is one hundred and eighty-eight times as much neon in the radioactive gas from the King's Well at Bath as in atmospheric air led to a repetition of experiments made by the author some years ago with Mr. Alexander Cameron, in which it was shown that when niton decomposes in presence of water, neon is one of the products. This conclusion has been questioned; the presence of neon has been ascribed to leakage of air into the apparatus; and Mr. Soddy has shown that it is possible to detect by the use of a spectroscope, the neon separated from 0·2 c.c. of air. The author has now proved that a leakage of at least 4 c.c. of air into the bulb, or during the processes of separation, would be necessary in order to account for the quantity of neon found; and as a proof that air had not leaked in, argon was tested for in the gases, and was found to be practically absent.

It is remarkable that although the water of the King's Well is fairly radioactive, neither free hydrogen nor free oxygen were

present in the gases bubbling out of the water. It is difficult to account for this, in face of the presence of a relatively large proportion of helium in the gases; the proportion is seventy-three times that normally present in air.

Discussion.

Prof. Travers said that some years ago, when he and Sir William Ramsay were searching for unknown inactive gases, they visited the Cauterets in the South of France, and collected samples of gas from several of the springs. The inactive fractions of these gases showed only the spectra of argon and helium. They were not, however, subjected to fractionation; and later, when the methods of dealing with liquefied gases had been worked out, and neon had been discovered, the samples had been lost.

***161. "An analysis of the waters of the thermal springs of Bath." By Irvine Masson and Sir William Ramsay, K.C.B.**

Analyses were given of the gases escaping from these waters; they consist of carbon dioxide (36·0 c.c.), nitrogen (954 c.c.), argon (7·263 c.c.), neon (2·334 c.c.), and helium (0·297 c.c.) per litre. There is no hydrogen or oxygen present. There is 0·78 times as much argon, 188 times as much neon, and 73 times as much helium as there is in atmospheric air. The gas also contained niton in a million litres, in equilibrium with 33·65 milligrams of radium. An analysis was also given of the dissolved solids; the chief constituent is calcium sulphate, and it may be noted that lithium, strontium, and bromine are also present. There is also a trace of dissolved radium.

Discussion.

Mr. Chapman said that he gathered from the authors that the ratio of iron to lime was much larger in the recent than in the ancient deposits, and suggested that if that were the case it would appear to indicate that the water had undergone some appreciable change in respect of its mineral constituents.

Sir W. Ramsay replied that the surface formation was oolitic; but the water came from an unknown depth, and the nature of the rock was unknown. The nearest known deposits of pitchblende were in Cornwall, about 150 miles to the south-west. He also pointed out that persons with a delicate sense of smell had told him that the water had a faint odour of bleaching powder.

Mr. Masson said that comparison with two other analyses made during the past forty years showed that the composition of the mineral content of the water varied considerably.

*162. "The colour intensity of copper salts." By Spencer Umfreville Pickering.

The colour intensity of copper in solutions of inorganic salts is practically a constant (taken as unity), and is unaffected by dilution. In cupri-compounds it is about 19 with the strongest solutions of which accurate measurements can be made, and generally diminishes on dilution, but is sometimes constant. These two values are explained as applying to bivalent and quadrivalent copper respectively, and the variation in colour intensity of all copper salts can be explained by their solutions containing the normal salt or the "cupri"-form of it (with quadrivalent copper) in varying proportions. Both these forms have been isolated and examined in the case of the glycerate and racemate. Such a view harmonises with the results of electrolysis, and with the coloration of iron and manganese when their valency is altered.

Discussion.

Dr. P. W. Robertson said that the work of Hantzsch and his collaborators had shown that the only trustworthy method of measuring the colour of a solution was to determine the absorption in different parts of the visible spectrum by means of a spectral photometer; to establish optical identity it was necessary also to show that the absorption curves coincided in the ultraviolet. Cases were known where solutions differing appreciably in tint (the eye being extremely sensitive in certain portions of the spectrum), nevertheless gave on measurement absorption-coefficients practically the same; this was caused by a slight shifting of an absorption band. Other cases were known where solutions which appeared similar to the eye gave at the edge of the spectrum absorption-coefficients widely different; this was due to the appearance of a band just within the visual region. Finally, there were cases where a solution which obeyed Beer's Law, that is, which had an absorption-coefficient remaining the same on dilution, had a totally different colour when diluted or when examined in thin layers; this phenomenon was due to the existence of a flat band near the centre of the visible spectrum. These facts indicated that the direct vision method of comparing colour must be used with considerable caution.

Mr. Pickering said that objections existed to the spectroscopic method (Sidgwick and Tizard, *Trans.*, 1908, **93**, 195), as well as to the use of the tintometer. Sidgwick and Tizard's results established the practical identity of the blue coloration, and its practical independence of dilution in the case of the sulphate, chloride,

bromide, and nitrate, but some solutions of copper salts were not blue at all. The independence of dilution in the case of the sulphate now appeared to be absolute. That Sidgwick and Tizard's results were affected by some source of error was shown by the fact that they indicated in the case of the organic salts a much higher value at infinite dilution than that actually realised now with very weak solutions. The change of valency of the copper atom without oxidation was similar to that recognised as occurring in the case of the halogens nitrogen, oxygen, etc. The group $C(OH)_2$ would not necessarily confer strong acidic properties any more than in the case of other hydrates.

***163. "Nitrites of the mercurialkyl- and mercurialkylaryl-ammonium series. Part II." By Prafulla Chandra Rây, Nilratan Dhar, and Tincowry De.**

From the measurements of their electric conductivities it is found that mercurihexamethylenetetra-ammonium and mercuriethylenediammonium nitrites belong to the ammonium type as they behave like the alkali nitrites.

***164. "Studies of dynamic isomerism. Part XIII. Camphorcarboxylamide and camphorcarboxypiperidide. An illustration of Barlow and Pope's hypothesis." By Walter Hamis Glover and Thomas Martin Lowry.**

The preparation of these two substances was described in a preliminary note in 1910 (*Proc.*, **26**, 162). By the slow evaporation of solutions in ethyl acetate, well-formed crystals have now been prepared. The amide is monoasymmetric: $a:b:c=1{\cdot}4736:1:1{\cdot}7683$ or $0{\cdot}7368:1:0{\cdot}8841$; $\beta=61°2'$. The piperidide is orthorhombic and hemihedral: $a:b:c=1{\cdot}5032:1:2{\cdot}4320$ or $0{\cdot}7516:1:1{\cdot}2160$. Whilst there is only an approximate morphotropic relationship between these two compounds, a remarkable agreement is found to exist between the parameters of the amide and those of the less stable form of Forster's α-benzoylcamphor, thus:

	Valency volume.	Equivalence parameters.
$C_{10}H_{15}O{\cdot}CO{\cdot}NH_2$	68	3·627 : 4·923 : 4·352
$C_{10}H_{15}O{\cdot}CO{\cdot}C_6H_5$	92	3·658 : 4·960 : 5·071

The significance of these relationships was discussed.

***165. "Studies of dynamic isomerism. Part XIV. Successive isomeric changes in camphorcarboxylamide and camphorcarboxypiperidide." By Thomas Martin Lowry and Walter Hamis Glover.**

Well-formed crystals of camphorcarboxylamide, whether separated from ethyl acetate or from benzene, are almost inactive when freshly dissolved in alcohol or in benzene, but increase rapidly in rotatory power to $[\alpha]_{5461} = 100°$ in alcohol and 70° in benzene. The initial solubility of these crystals in heptane does not exceed 0·24 gram per 100 grams of solvent, as contrasted with 0·38 gram for the minute crystals which separate from light petroleum. By similar methods the initial solubility of the piperidide is reduced from 2·06 to 1·64 grams per 100 grams of heptane.

Both substances give rise to inflected mutarotation curves. These are too complex to be accounted for by two successive unimolecular changes, and point to the existence of three or more isomeric changes involving four or more isomeric forms of each substance.

***166. "The continuous fractional distillation of water." By William Robert Bousfield.**

In accurate work on the conductivities of dilute aqueous solutions it is recognised that the water employed should approximately have a conductivity which is represented by $K_{18} = 1 \times 10^{-6}$. In a former paper (*Trans.*, 1905, **87**, 740) the author described an apparatus by means of which water of this order of purity could be produced by continuous fractional distillation from "tap water," that is to say, the ordinary town-water supply. There were now described two forms of apparatus, constructed on the same principles, but simplified, and more easily managed. The first of these presents great advantages as a still for every-day use, yielding about 30 litres of water a day (working day and night), two-thirds of which has a conductivity of about 0·8, the remainder being distilled water of ordinary character. The foregoing result is produced without the use of chemicals. If a strongly alkaline solution of potassium permanganate is supplied with the feed-water at the rate of about 10 drops a minute, water of a slightly lower conductivity can be continuously produced. The other apparatus, which may be referred to as the three-bottle apparatus, is suited for the continuous redistillation of water under diminished pressure. By

the use of this apparatus, water having a conductivity of 0·5 may be continuously produced by the redistillation of the ordinary product of the first still.

167. "Studies on certain aliphatic hydroxy-acids." By Henry John Horstman Fenton and William Arthur Reginald Wilks.

The authors are continuing the study of the oxidation of various organic substances in presence of ferrous iron as catalyst, and of the properties and relationships of the products. An account was given of (1) the transformation of oxalacetic acid into dihydroxymaleic acid, (2) the isolation of bromo-oxalacetic anhydride (or bromo-hydroxymaleic anhydride), (3) the tautomeric dihydroxymaleic esters, (4) "aldehydo-glyceric" acid, and (5) the products obtained by condensation of these substances, and others, with carbamide.

168. "Formation of seven- and eight-membered rings from 2:2′-ditolyl." By James Kenner.

In continuation of the work already described, on ring-formation with the aid of derivatives of 2:2′-ditolyl, it has now been found that the behaviour of ωω′-dibromo-2:2′-ditolyl towards diethyl malonate and tetraethyl ethanetetracarboxylate is similar to that of *o*-xylylene dibromide (compare Kenner and Turner, *Trans.*, 1911, **99**, 2107).

Dibenzocycloheptadienedicarboxylic acid, $\begin{matrix} C_6H_4\cdot CH_2 \\ | \\ C_6H_4\cdot CH_2 \end{matrix}\!\!>\!C(CO_2H)_2$, forms prisms which melt at 205°, and decompose into carbon dioxide and *dibenzocycloheptadienemonocarboxylic acid*, m. p. 157·5°; the *methyl* ester of the latter acid is a highly refractive, viscous liquid, b. p. 288°/181 mm., and gradually solidifies to radiate masses of thin plates.

Tetraethyl dibenzocyclooctadienetetracarboxylate forms rhombic crystals, m. p. 108°.

The reactions of these and other derivatives from 2:2′-ditolyl are under investigation.

169. "Contributions to the chemistry of the terpenes. Part XIII. The preparation of pure bornylene." By George Gerald Henderson and William Caw.

The best method of obtaining bornylene in quantity is to decompose methyl bornyl xanthate, which is easily prepared from borneol,

by heating to a temperature not exceeding 200°, but the product contains a certain proportion of an isomeric terpene (either cyclene or camphene), and hitherto no satisfactory process of removing this impurity has been described. It has now been found that crude bornylene can be completely purified by treatment, under suitable conditions, with a limited quantity of hydrogen peroxide, and that the yield of the pure hydrocarbon is at least 60 per cent. of the original material.

170. "The interaction of bromine and the sulphides of β-naphthol." By Thomas Joseph Nolan and Samuel Smiles.

The interaction of bromine and the stable and unstable sulphides of β-naphthol was described. The former yields 2:6-dibromo-β-naphthol, whilst the latter furnishes dibromonaphthasulphoniumquinone, in which the substitution is homonuclear. The latter compound was also obtained by bromination of the sulphonium-quinone. It was concluded that the situation of the thio- and hydroxyl group in either sulphide is the same, and that the stable sulphide behaves as a true derivative of β-naphthol, whilst in the unstable sulphide the naphthalene nucleus behaves similarly to that in the sulphonium-quinone. Whether this peculiar behaviour of the latter compound is due to preliminary oxidation to the quinone will be decided by future experiments.

171. "The absorption spectra of some substances containing two benzene nuclei." By John Edward Purvis and Nial Patrick McCleland.

A description was given of the absorption spectra of solutions of some hydrocarbons, ketones, amines, and ethers consisting of two benzene nuclei united by a chain of other groups. The mutual effect on one another of the two benzene nuclei and other oscillation centres in the molecule was discussed.

The bands observed in the vapour of anisole at various temperatures and pressures were also described, and compared with the solution bands.

172. "The influence of the constitution of tertiary bases on the rate of formation of quaternary ammonium salts." (Preliminary note.) By Ebenezer Rees Thomas.

Although some investigations have been carried out on the rate of combination of a few tertiary bases with various alkyl haloids, no accurate measurements have as yet been made of the rate of

formation of quaternary ammonium salts from tertiary aromatic amines of the type $C_6H_5 \cdot NXY$.

It was considered of interest to investigate the effect which the nature of the groups X and Y would have on the rate of such a reaction. No "heterospasis" or any such effect as Clarke describes (*Trans.*, 1910, **97**, 416) was observed with carefully purified reagents. The reaction was carried out at 40° with $N/10$-absolute alcohol solution, the quaternary ammonium bromide being estimated gravimetrically as silver bromide.

The rates ($k \times 10^3$ given in each case) for dimethylaniline (1·076), diethylaniline (0·094), methylethylaniline (0·660), methylallylaniline (0·324) with allyl bromide have been determined.

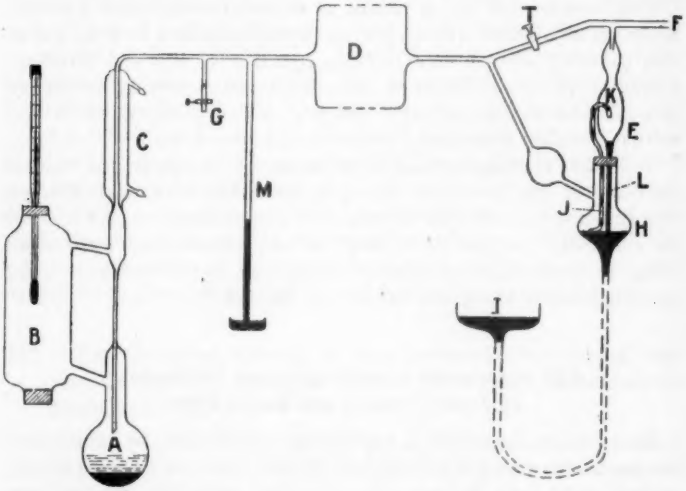
The results led to a study of dimethyl-*o*-toluidine (0·0573), dimethyl-*m*-toluidine (1·42), *p*-bromodimethylaniline (0·284), quinoline (0·0584), *iso*quinoline (0·450), pyridine (0·40), and 2-methylquinoline (0·0324). In some cases the reaction-velocity for benzyl bromide was also determined, and was in nearly every case related to that for allyl bromide in the ratio of about 6 : 1.

The effect of unsaturation of the attached groups on the residual affinities of the tervalent nitrogen atom has also been studied. The indications as to the influence of the strength of the base on its reactivity are not of a very definite nature, any such effect being in many cases completely masked by steric hindrance. The investigation is being continued and extended.

173. "An easily adjustable vapour thermostat." By James Fletcher and Daniel Tyrer.

The authors described a vapour-bath which can be maintained constant with very little trouble to 0·005°, and can be fixed at any desired point (say, between 30° and 130°) with the greatest ease. In principle it consists of a pure liquid boiling under a constant and adjustable pressure, which is controlled and maintained constant by a very efficient manostat. Practically any liquid of suitable boiling point may be used. The boiling liquid is contained in the flask *A* (see diagram). The vapour passes into the compartment *B*, which may be of any particular form suitable; *B* also contains a thermometer, as shown. The vapour is then condensed in *C*, and returns as liquid to the boiling flask *A*. The end of the condenser *C* is connected, as shown, with an air reservoir *D*, of about 10—20 litres capacity (the larger the size of this reservoir the greater is the efficiency of the apparatus), and then to the manostat *E*. The manostat being the most important part of the apparatus may be described at some

length, and for the sake of clearness has been drawn in the diagram on a rather large scale. The tube *F* is attached to an efficient water-pump. The degree of exhaustion is first roughly adjusted by allowing air to enter by the side-tube and pinch-cock *G*. The mercury rises into the bulb *H* out of the reservoir *I* until the level reaches the end of the tube *J*, when it stops and remains constant. If it passes this point it closes off the rest of the apparatus from the pump, and as air is entering through the side-tube *G* the pressure increases and the level of the mercury in the manostat falls again. As soon as the end of the tube *J* becomes uncovered, the pump again comes into play and rapidly reduces



the pressure, causing the mercury level to rise again. When equilibrium is reached the level of the mercury remains constant, and a continual current of air and mercury passes up the tube *J* into the compartment *K*, from whence the mercury falls back into the bulb *H* by the tube *L*, and the air passes off through the pump. It will be clear that the difference in the levels of the mercury in *H* and *I* represents the pressure in the apparatus, and the adjustment of this pressure is made by merely altering the height of the reservoir.

For the proper working of the manostat it is necessary to have a large air supply to draw from; otherwise the mercury level in *H* rises and falls irregularly. This is the purpose of the air reservoir *D*. Although the level of the mercury in *H* may fluctuate

slightly, the pressure recorded by the manometer *M* remains perfectly constant. In order to raise the temperature in *B*, the mercury reservoir *I* is raised, and to lower the temperature it is merely necessary to lower *I*.

For the efficient working of the apparatus attention must be paid to the following details: The reservoir should be shallow, so that if the vessel *K* partly fills with mercury, as sometimes happens, the difference in the mercury levels in *H* and *I* is not appreciably altered. The end of the tube *J* should be a narrow slit not wider than 0·5 mm., and bent horizontally. The width of this slit ensures that the greatest possible variation in the pressure is 0·5 mm., although the actual variation need not exceed 0·1 mm. In order to accelerate the initial exhaustion of the apparatus the tap *T* is provided as a by-pass, which at all other times must be closed. The connecting tubes should be of wide bore, so that the pressure at all parts of the apparatus is absolutely the same.

The boiling liquid used must be pure, and must boil quietly without bumping. It is found that bumping is prevented, however low the pressure, by placing in the flask *A* a layer of mercury as indicated. It is better to boil the liquid over a small free flame shielded from draughts. If the efficiency of the water-pump varies considerably, and if it is desired to have a very constant temperature, it is better to use two manostats connected together with an air reservoir and air inlet tube between them. The temperature can, however, be maintained constant to about 0·01° with one manostat.

Change of the atmospheric pressure affects the constancy of the temperature, and to a smaller extent change of the room temperature owing to the alteration in the density of the mercury. These influences must be obviated by personal observation and adjustment.

If rubber stoppers are used, an alcohol should be employed as the boiling liquid, but with ground-glass connexions lubricated with glycerol–dextrose mixture any liquid can be used. For temperatures ranging from 30° to 65° the authors recommend methyl alcohol, from 40° to 70° ethyl alcohol or benzene, and for higher temperatures toluene or xylene.

In experiments made with a Beckmann thermometer in *B* and with a double manostat, it was found that for short periods of time the temperature remained constant to 0·001°. For longer periods the variation is greater, but so long as the atmospheric pressure remains unchanged the temperature remains constant to about 0·005°.

This form of thermostat has many advantages over the usual large water-bath. It is more quickly adjustable, and need not be left going for long periods of time, as it is only a matter of a few minutes to start it again.

174. "Contributions to our knowledge of semicarbazones. Part I. Semicarbazones of phenyl styryl ketone." By Isidor Morris Heilbron and Forsyth James Wilson.

The authors have extended their investigations, of which a preliminary account has appeared (*Proc.*, 1911, **27**, 325). They find that phenyl styryl ketone is apparently capable of yielding four semicarbazones, two white and two yellow, and adduce reasons for regarding these forms as stereoisomerides. The absorption spectra of the various modifications have been investigated, and the effect of ultra-violet light on the different forms has also been studied.

175. "The essential oil of 'Nepal sassafras' or 'Nepal camphor' tree." By Samuel Shrowder Pickles.

The essential oil from the wood of the Indian tree *Cinnamomum glanduliferum*, Meissn, has been examined and found to have the following general characters: D_{15}^{15} 1·1033; α_D^{20} −0°4′ (in a 1-dcm. tube); saponification value, 2·8; saponification value after acetylation, 7·0.

The oil is pale yellow, and possesses an odour resembling safrole with, however, a suggestion of anise. The yield obtained from the dried ground wood by steam distillation was 4·16 per cent. The oil is soluble in half its volume of 90 per cent. alcohol, and in five volumes or more of 80 per cent. alcohol.

An exhaustive examination showed the oil to consist mainly of safrole, myristicin, and elemicin. Other constituents, present in small quantities, are palmitic acid (m. p. 62·5°), esters of the lower fatty acids, and traces of phenols.

176. "The addition of hydrocyanic acid to derivatives of glutaconic acid and itaconic acid." (Preliminary note.) By Edward Hope.

In extending the application of the method employed for the synthesis of β-methyltricarballylic acid (*Trans.*, 1912, **101**, 899), the author has investigated the addition of hydrogen cyanide to the following substances: ethyl itaconate, ethyl teraconate, ethyl glutaconate, ethyl αγ-dicarbethoxyglutaconate, ethyl αγ-dicarbethoxy-α-methylglutaconate, and ethyl γ-cyano-αβ-dimethylglutaconate.

In the case of ethyl itaconate the reaction proceeds quantitatively with the production of *ethyl γ-cyanopropane-αβ-dicarboxylate*, $CO_2Et{\cdot}CH_2{\cdot}CH(CO_2Et){\cdot}CH_2{\cdot}CN$, which boils at 171°/18 mm., and on hydrolysis gives an almost quantitative yield of tricarballylic acid. In the cases of ethyl teraconate and ethyl glutaconate, no appreciable addition of hydrogen cyanide has yet been observed to occur. Ethyl αγ-dicarbethoxyglutaconate and ethyl αγ-dicarbethoxy-α-methylglutaconate readily combine with the elements of hydrogen cyanide, yielding esters of very high boiling point which probably possess the constitutional formulæ (I) and (II) respectively:

$(CO_2Et)_2{\cdot}CH{\cdot}CH(CN){\cdot}CH(CO_2Et)_2$ (I.)

$(CO_2Et)_2{\cdot}CMe{\cdot}CH(CN){\cdot}CH(CO_2Et)_2$ (II.)

The ester (I) on hydrolysis gives a large yield of tricarballylic acid and (II) an equally good yield of the isomeric α-methyltricarballylic acids.

Ethyl γ-cyano-αβ-dimethylglutaconate readily combines with hydrogen cyanide with the production of *ethyl γδ-dicyanoisopentane-βδ-dicarboxylate*, $CH_2{\cdot}CH(CO_2Et){\cdot}CMe(CN){\cdot}CH(CN){\cdot}CO_2Et$, a viscid oil boiling at 200—206°/20 mm.

The general behaviour of these additive products and of others prepared by similar methods is under investigation, and it is hoped that these compounds will afford methods for preparing many hitherto unavailable substituted tricarballylic acids.

177. "The possible limitation of molecular magnitude." By Holland Crompton.

No upper limit is usually assigned to molecular magnitude. E. Fischer has synthesised a polypeptide with the molecular weight 1212, and in the case of colloids molecular weights of the order 10^4, and even 10^5, are commonly spoken of. A difficulty arises, however, in admitting that molecular weights can exceed a certain value, unless the density increases as the molecular weight increases.

For suppose that a compound can exist, such as a protein, with a density at 0° not much greater than that of water, and with a molecular weight of rather more than 30,000, the gram-molecule of such a compound at 0° would occupy about 30,000 c.c. The gram-molecule of a perfect gas under the standard conditions occupies only 22,400 c.c., and we should therefore have a solid compound, at 0° and under a pressure that cannot be less than one atmosphere, occupying a greater molecular volume than that of any gas.

That the molecules of liquids and solids should occupy greater volumes than those of gases under similar conditions, seems at first contrary to the usual conceptions of the gaseous, liquid, and solid states. It is true that at sufficiently low temperatures this condition must arise for all substances, but a simple calculation shows that for the majority of chemical compounds it would only occur at temperatures not far removed from the absolute zero.

Two suggestions appear to be indicated. The first is that under the ordinary conditions there is an upper limit to molecular magnitude, and that for most substances, more especially colloids, the molecular weight cannot exceed a value of about 20,000. The second is that our ordinary kineto-molecular conceptions no longer apply when for a given temperature the molecular magnitude exceeds a certain critical value. The latter view seems most in keeping with our present knowledge, and perhaps serves to throw some light on the behaviour of colloids.

178. "The products of the oxidation of chloroacenaphthene with chromic acid." By Holland Crompton and Wilhelmina Rebecca Smyth.

Chloroacenaphthene was dissolved in about ten times its weight of boiling acetic acid, and then treated with from three to five times its weight of sodium dichromate. A vigorous reaction takes place, which is complete in about fifteen minutes. Three products are always formed, namely, chloroacenaphthenequinone, dichlorodiacenaphthylidenedione, and chloronaphthalene-1 : 8-dicarboxylic acid. The smaller proportion of dichromate favours the production of the first two, the larger proportion that of the third product. The yields are almost theoretical. The reaction product after being well washed with water is first boiled with a 10 per cent. solution of sodium carbonate to remove the chloronaphthalene-1 : 8-dicarboxylic acid, and then heated with a concentrated solution of potassium hydrogen sulphite to extract the quinone. The residue after washing and drying is finally crystallised from xylene.

Chloroacenaphthenequinone, $C_{12}H_5O_2Cl$, is obtained from the potassium hydrogen sulphite solution by boiling this with sulphuric acid. It crystallises from acetic acid in yellow needles melting at 216° (corr.). The crystalline potassium hydrogen sulphite compound has the composition $C_{12}H_5O_2Cl,KHSO_3,2H_2O$. It gives a colourless *dioxime* with hydroxylamine, this compound gradually blackening on heating, but having no definite melting point. With phenylhydrazine it gives a brilliant red *monohydrazone*, melting at 174° (corr.). No dihydrazone was obtained.

Dichlorodiacenaphthylidenedione, $C_{10}H_5Cl<\begin{matrix}CO\\C\end{matrix}=\begin{matrix}CO\\C\end{matrix}>C_{10}H_5Cl$,

crystallises in small, orange-red needles melting at 328° (corr.). It is very sparingly soluble in alcohol, chloroform, or acetic acid, but fairly so in boiling xylene, from which it can be crystallised. On reduction with hydriodic acid it gives chloroacenaphthene.

Chloronaphthalene-1:8-dicarboxylic acid has been already described (*Proc.*, 1908, **24**, 241), but the melting point of the anhydride is found to be higher than that previously given, and should be 213° (corr.). Salts of this acid were prepared and analysed.

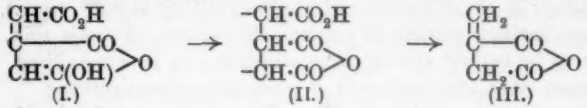
179. "The influence of colloids and fine suspensions on the solubility of gases in water. Part II. Solubility of carbon dioxide and of hydrogen." By Alexander Findlay and Bucchok Shen.

In continuation of the work of Findlay and Creighton (*Trans.*, 1910, **97**, 536), the authors have determined the solubility of carbon dioxide in solutions of ammonium chloride, potassium chloride, barium chloride, ferrous ammonium sulphate, sucrose, chloral hydrate, methyl-orange, peptone, propeptone, and hæmoglobin; and of hydrogen in solutions of dextrin, starch, gelatin, ferric hydroxide, and a suspension of metallic silver. It is found that the solubility of carbon dioxide in solutions of the salts mentioned above and in solutions of sucrose and chloral hydrate is in harmony with Henry's law, so that the behaviour found in the case of these solutions is different from that met with in the case of colloidal solutions. In the solutions of peptone, propeptone, and hæmoglobin the solubility of carbon dioxide is greater than in water, but decreases as the pressure is increased. This behaviour is explained on the basis of chemical combination. The solubility of hydrogen in solutions of dextrin, starch, gelatin, ferric hydroxide, and in a suspension of finely divided silver is, with the possible exception of the solutions of gelatin, in harmony with Henry's law.

180. "The chemistry of the aconitic acids. Part I. The labile modification of aconitic acid and the hydroxy-anhydro-acid." By Norman Bland and Jocelyn Field Thorpe.

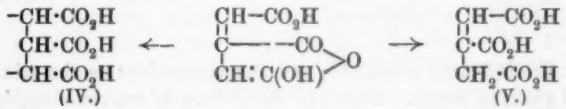
The structure of the hydroxy-anhydro-acid mentioned in a preliminary communication (this vol., p. 131) has been found to be that represented by formula (I), since it passes into the normal

anhydro-acid (II) when heated above its melting point, and yields itaconic anhydride (III) when heated at a higher temperature:



(I.) M. p. 135°. (II.) M. p. 76°. (III.)

The hydroxy-anhydro-acid is converted into normal aconitic acid (IV) by hydration with water, but yields labile aconitic acid (V) when hydrated by strong alkali or by dilute alkali in the presence of casein:



(IV.) M. p. 191°. (V.) M. p. 173°.

Derivatives of the hydroxy-anhydro-acid and of the labile acid were described.

181. "The action of bromine on cholesteryl benzoate." (Preliminary note.) By Charles Dorée and Charles Stotesbury.

It was observed by Obermüller (*Zeitsch. physiol. Chem.*, 1891, **15**, 42) that cholesteryl benzoate, when treated in the cold with a solution of bromine in carbon disulphide, did not give the expected cholesteryl benzoate dibromide, $C_{27}H_{45}OBr_2 \cdot C_7H_5O$; instead, a monobromo-substituted derivative, $C_{27}H_{44}OBr \cdot C_7H_5O$, melting at 138° was obtained. The authors, in repeating this, find that during the bromination only a very slight evolution of hydrogen bromide takes place, and that the product contains two substances which differ in solubility and crystalline form. The more soluble one crystallises from acetone in needles melting at 139°, and appears to be identical with the derivative mentioned above. The other is very characteristic, crystallising in large (frequently 1 cm. long), clear, hexagonal prisms melting at 168°. The yield of this substance is increased if chloroform is used as the solvent. Analysis agrees with the formula $C_{27}H_{45}OBr_2 \cdot C_7H_5O$, and the investigation is being continued in order to ascertain whether this compound is the hitherto unknown benzoate dibromide.

182. "A theory of fluorescence." By Edward Charles Cyril Baly and Rudolf Krulla.

In every compound formed by virtue of primary valencies alone, the secondary valencies of the atoms are unsaturated. Every such

atom must therefore form the centre of a field of force, but the independent existence of these fields must be metastable, and they must condense together with the escape of free energy. Such condensed systems of force lines can be opened by the influence of a solvent and of light. The opening up takes place in stages, each stage absorbing definite light waves. On the basis of this conception was put forward a theory of fluorescence, and experimental evidence was given in favour of it. Certain substances were shown in one solvent to emit fluorescent light of the same wavelength as they absorb in a second solvent.

183. "Chemical reactivity and absorption spectra. Part I." By Edward Charles Cyril Baly and Francis Owen Rice.

The authors have considered the condensed force fields which must exist around the molecules of a compound, with regard to the phenomena of fluorescence (preceding abstract). With reference to the question of their chemical reactivity, it is evident that the reactivity of these closed systems must be vanishingly small, and that no molecules can enter into any chemical reaction until these systems have been opened up. There must be, therefore, at least two stages in any chemical reaction, one in which the closed system is opened up, and the other in which the reaction proper takes place. These two stages have been observed in the sulphonation of the benzene ring by means of absorption spectra, and the absorption curves show the stages in the sulphonation of anisole, *o*- and *p*-nitroanisole, quinol dimethyl ether, and other substances.

184. "The wet oxidation of metals. Part II. The rusting of iron" (continued). By Bertram Lambert.

The work published by the author and a collaborator (*Trans.*, 1910, **97**, 2426) on the corrosion of commercial forms of iron has been criticised by Friend ("The Corrosion of Iron and Steel," p. 65), "T. M. L." (*Nature*, 1911, p. 25), and "H. E. A." (*Science Progress*, 1911, 642). It is suggested (1) that all traces of carbonic acid had probably not been removed from the apparatus used; (2) that there is a serious objection to the use of quartz vessels, since the quartz might dissolve to a sufficient extent to play the same part as is usually attributed to carbonic acid by the supporters of the acid theory of corrosion; (3) that water prepared by distillation from strong solutions of barium hydroxide probably contains traces of carbonic acid.

The experiments have been repeated with additional precautions

and refinements which have been devised to test the validity of these objections. The results of the experiments go to show that the objections have no foundation in fact, and that it may be considered as established beyond any reasonable doubt that commercial forms of iron will always undergo corrosion when exposed to the action of water and oxygen, even in the complete absence of carbonic acid or any other acid.

An electrolytic theory of the corrosion of iron, based on the differences in solution tension of different parts of the metal, was discussed.

Some further properties of pure iron were described, in particular its behaviour towards solution of copper salts. Pure iron can be exposed to the action of saturated solutions of copper sulphate or copper nitrate at the ordinary temperature without copper being deposited on the iron, but exposure to extremely dilute solutions of copper chloride will cause the immediate deposition of copper on the iron.

185. "Colouring matters of the flowers of the Cedrela toona." By Arthur George Perkin.

These flowers, which constitute an Indian dyestuff of minor importance, yield a minute amount of a red, crystalline colouring matter, $C_{15}H_{18}O_3$, identical with the nycanthin obtained by Hill (*Trans.*, 1907, **91**, 1501) from the flowers of *Nycanthes arbor tristis*. This melts at 285—287°, and not 234—235°, as given by Hill, and in dyeing and other properties closely resembles, but is not identical with, the bixin of annatto (*Bixa orellana*). The presence of quercetin contaminated with a trace of an allied colouring matter as glucosides, and of a sugar, $C_{12}H_{22}O_{11}$, have also been detected, and to the former the main dyeing properties of the flowers appear to be due.

186. "The so-called manganese trioxide." (Preliminary note.) By Frederick Russell Lankshear.

Franke's "pink gas" (*J. pr. Chem.*, 1887, [ii], **36**, 31, 166; Thorpe and Hambly, *Trans.*, 1888, **53**, 175) is conveniently prepared by allowing a 6 per cent. solution of potassium permanganate in concentrated sulphuric acid to drop into a well-cooled mixture of 1 part of sodium hydrogen carbonate with 4 parts of anhydrous sodium carbonate. The evolved gases are led into a tube cooled in liquid air, where a pink solid mass soon forms. When the carbon dioxide has volatilised from this, an amorphous solid

remains, which usually melts at about −6°. It effervesces with sodium carbonate, is free from sulphuric acid, and dissolves quietly in water to form a brownish-red solution, which, however, soon deposits manganese dioxide, leaving permanganic acid in solution.

The pink substance is also formed by the action of moist air on the invisible gas given off by the solutions of potassium permanganate in sulphuric acid. This gas has been aspirated through a tube cooled in liquid air, and found to be manganese heptoxide, Mn_2O_7.

Determinations of the water in the "pink gas" give a mean ratio of about 15 molecules of water to 1 of manganese compound. The ratio of oxygen to manganese has been measured in two ways: by measuring the volume of oxygen and the weight of manganese dioxide (estimated as Mn_3O_4) given on heating the pink substance, and by measuring the permanganic acid and the manganese dioxide produced (Chatard's process) when the pink gas is blown into water. The former measurement gave a ratio O/MnO_2 of 1·25 to 1; the latter 1·24 to 1. There is thus more oxygen in the substance than required by the formula MnO_3, and less than that demanded by Mn_2O_7.

In view of the facts that much water is present, that solutions of permanganate in sulphuric acid give off manganese heptoxide which forms the "pink gas" with moist air, and that the ratio of oxygen lies nearer that required by permanganic than by manganic acid, it must be concluded that the manganese-containing constituent of Franke's "pink gas" is merely hydrated permanganic acid with varying quantities of lower oxides or hydroxides, so that the existence of the oxide MnO_3 still requires demonstration.

187. "Co-ordination compounds of vanadium." (Preliminary note.) By Gilbert T. Morgan and Henry Webster Moss.

Anhydrous vanadium trichloride reacts with acetylacetone in the presence of some reagent for removing hydrogen chloride to give rise to two acetylacetonates.

Vanadium teracetylacetonate, $V\left[<^{O:CMe}_{O\cdot CMe}>CH\right]_3$, is produced either by treating vanadium trichloride and acetylacetone in alcoholic solution with the calculated quantity of sodium ethoxide, or by adding aqueous sodium carbonate to a mixture of the trichloride, acetylacetone, and chloroform, when the product dissolves in the organic solvent, and crystallises therefrom in transparent, yellowish-brown plates or prisms. The compound separates from alcohol or from acetylacetone in reddish-brown prisms; it melts at 265—266°, and can be distilled without decomposition.

Vanadium oxybisacetylacetonate, $VO\left[<^{O:CMe}_{O\cdot CMe}>CH\right]_2$, results from the aerial oxidation of the preceding substance; it crystallises from ether or alcohol in well-defined, hard, transparent, bluish-green plates and prisms, which decompose and char on heating. Compounds corresponding with the preceding acetylacetonates have been prepared from benzoylacetone and vanadium trichloride.

The trichloride and pyridine combine either alone or in alcoholic solution to form a very soluble co-ordination compound dissolving in alcohol to an intensely purple solution. Ethylenediamine changes the green colour of alcoholic vanadium trichloride to a deep brown; the co-ordination product is very soluble.

Methylamine, dimethylamine, triethylamine, and benzylamine produce a similar colour change to brown in the green alcoholic solution of the trichloride; the products of these interactions are under examination. Vanadium trichloride dissolves in liquid ammonia, the product being soluble in water.

Although soluble in absolute alcohol to a green solution, anhydrous vanadium chloride is insoluble in dry ether free from alcohol.

The authors proposed to continue the investigation of co-ordination compounds containing vanadium as the central element.

188. "Substituted thiolazo-derivatives of benzene."
By John Jacob Fox and Frank George Pope.

Benzeneazophenylmethylmercaptole, $C_6H_5\cdot N{:}N\cdot C_6H_4\cdot SMe$, and *benzeneazophenylethylmercaptole* have been prepared by the action of the corresponding alkyl iodides on the potassium salts obtained by the hydrolysis of the xanthic ester derived from aminoazobenzene. These substances resemble the corresponding ethers of benzeneazophenol, and yield hydrochlorides and hydrates.

p-*Nitrobenzeneazophenylmethylmercaptole* was obtained in small amount by the action of *p*-nitrobenzenediazonium chloride on phenyl mercaptan in alkaline solution, and subsequent treatment of the potassium salt of *p*-nitrobenzeneazophenylmercaptan with methyl iodide.

The band in the absorption spectrum of benzeneazophenylmethylmercaptole was found to occupy an intermediate position between the bands given by benzeneazophenetole and aminoazobenzene.

Extra Meeting of the Society.

At an Extra Meeting of the Chemical Society held on Wednesday, June 26th, 1912, at 8.30 p.m., Professor Percy F. Frankland, LL.D., F.R.S., President, in the Chair, Sir William Tilden delivered the Cannizzaro Memorial Lecture.

A vote of thanks to Sir William Tilden, proposed by Sir William Ramsay, seconded by Sir Edward Thorpe, was supported by the President, and carried with acclamation.

INTERNATIONAL ASSOCIATION OF CHEMICAL SOCIETIES.

The following announcement of the Proceedings at the meeting of the International Association of Chemical Societies, held in Berlin in April, 1912, is made by order of the Council.

Extract from the Minutes of the Second Meeting of the Council in Berlin, April 11th—13th, 1912.

The following were present:

(*a*) As full members of Council:

W. Ostwald, President, H. Wichelhaus, Vice-President, P. Jacobson, General Secretary, for the Deutsche Chemische Gesellschaft;

A. W. Crossley, P. F. Frankland, W. Ramsay for the Chemical Society (London);

A. Béhal, A. Haller, M. Hanriot for the Société Chimique de France;

Fr. Fichter, Ph. A. Guye, A. Werner for the Schweizerische Chemische Gesellschaft;

W. A. Noyes for the American Chemical Society;

N. S. Kurnakow, L. A. Tschugaeff, P. J. Walden for the Russian Chemical Society.

(*b*) As members of Council in an advisory capacity only:

Ch. Marie for the Société de Chimie-Physique, Paris; Fr. Auerbach for the Deutsche Bunsen Gesellschaft; E. Cohen for the Nederlandsche Chemische Vereeniging; H. Goldschmidt for the Polyteknisk Forenings Kemikergruppe (Christiania); E. Biilmann for the Kemisk Forening, Copenhagen.

During the course of the meeting the following members included in section (*b*), namely, Messrs. E. Cohen, H. Goldschmidt, and E. Biilmann, joined the Council as full members in consequence of a decision to confer upon their respective societies the right of representation on the Council.

The following Members of Council, Messrs. Carrara (Società Chimica Italiana), Day (American Chemical Society), Oglialoro (Soc. Chim. Ital.), Paternò (Soc. Chim. Ital.), and Richards (Amer. Chem. Soc.), notified their inability to attend the meetings.

The President of the Association, W. Ostwald, occupied the Chair.

The Chairman presented a Report on the development of the Association during the first year of its existence from April, 1911, to April, 1912. The Association, which originally consisted only of three Societies [the Société Chimique de France, the Chemical Society (London), and the Deutsche Chemische Gesellschaft], had grown considerably during the year—due, in part, to the acceptance of invitations to join the Association, and in part to the granting by the Council of applications for admission—and the Association now included representatives of almost all countries in which Chemical Societies exist.

During the meeting several requests for admission into the Association or for representation on the Council were granted. The membership of the Association at the close of the meeting may be seen from the following list of constituent Societies arranged in their order of admission:

	Number of Members.
*Société Chimique de France (25 April, 1911)	1024
*The Chemical Society (London) (25 April, 1911) ...	3132
*Deutsche Chemische Gesellschaft (25 April, 1911) ...	3352
Société de Chimie-Physique (15 June, 1911)	202
Deutsche Bunsen Gesellschaft für angewandte physikalische Chemie (19 June, 1911)	719
*Nederlandsche Chemische Vereeniging (14 July, 1911)	502
*Schweizerische Chemische Gesellschaft (3 August, 1911)	287
*American Chemical Society (6 October, 1911) ...	5603
*Russian Chemical Society (22 October, 1911)	399
*Polyteknisk Forenings Kemikergruppe (Christiania) (27 October, 1911)	105
*Verein Österreichischer Chemiker (28 October, 1911) ...	972
*Società Chimica Italiana (11 January, 1912)	648
*Kemisk Forening, Copenhagen (23 January, 1912) ...	137
Tokyo Chemical Society (18 March, 1912)	544
*Société Espagnole de Physique et de Chimie (10 April, 1912)	?
Total about	18000

* The societies marked with an asterisk (as the representative societies of their respective countries) are each entitled to send three delegates to the Council (cf. Articles IV and V of the Statutes).

"Suggestions for the Alteration and Amplification of the Statutes" were next considered. After discussion, alterations of Articles IV, V, and XII, concerning the method of voting (*a*) on the admission of new Societies to the Association, (*b*) on alterations in the Statutes, and also a supplementary Article XIII, dealing with the case of an equality of votes, were unanimously carried.

The statutes, as at present constituted, are given in Appendix I.

The meeting next proceeded to consider the reports of the Committees on the following questions:

(1) The Nomenclature of Inorganic Chemistry,
(2) The Nomenclature of Organic Chemistry,
(3) The Unification of Physical Constants.

In accordance with the decision of the Council at its first meeting in Paris on the 25th and 26th of April, 1911, the Societies represented on the Council had been requested to nominate committees for the consideration of these questions. The following Societies had accordingly each appointed three committees, all of which, eighteen in number, had presented reports:

Société Chimique de France;
The Chemical Society (London);
Deutsche Chemische Gesellschaft;
Schweizerische Chemische Gesellschaft;
American Chemical Society;
Russian Chemical Society.

The discussion turned mainly on the methods of organisation in connexion with these questions, the consideration of the actual subject-matter being postponed until a later date. The meeting was called upon to decide as to whether the questions should continue to be dealt with by the national committees or whether the latter should be replaced by smaller international committees. The Council was of opinion that with regard to inorganic and organic nomenclature, the circumstances were different from those obtaining in the case of the unification of chemical and physical constants.

The following resolution concerning inorganic and organic chemical nomenclature was carried unanimously:

"The national committees shall continue to exist for the present. Any Societies represented on the Council which have not as yet appointed committees shall proceed to do so forthwith."

"The reports of the committees are to be submitted to a process of sifting before the next meeting of the Council. The method of sifting to be adopted is a matter for arrangement between the

officers of the Association and the committees' representatives on the Council."

In order to avoid any confusion arising out of the premature adoption and publication by authors of nomenclature suggested by their respective national committees, the following resolution was unanimously carried by the Council:

"The Council expresses the hope that the introduction of new suggestions for nomenclature in place of existing terms will be avoided as far as possible until the question of nomenclature has been formulated by the Association. Authors' suggestions regarding nomenclature should be submitted to the existing committees for their consideration."

Chemical Societies are to be requested to publish in their respective journals this resolution, which is not meant to prejudice the publication of new suggestions when the necessity arises in consequence, for example, of the discovery of new types of compounds.

The composition of the existing committees on inorganic and organic chemical nomenclature is given in Appendix II.

With regard to the third question, namely, the unification of physical chemical constants, it was pointed out, both in the reports of the committees and during the course of the discussion, that a considerable amount of work had already been done in that direction by existing organisations, for example, the Deutsche Bunsen Gesellschaft, and the authors of "Tables of Physical Chemical Constants." It was therefore generally considered that there was no further need for the existence of the various national committees appointed by the Council. Accordingly an international Commission was nominated, composed of those Members of the Council who by their activities were most directly concerned with this question, namely, Messrs. Carrara, Cohen, Day, Goldschmidt, Guye, Ostwald, Ramsay, Richards, and Walden. This Commission should, as far as possible, work in agreement with other existing organisations appointed for the same purpose.

It was next announced by the President that the members of the International Committee on Atomic Weights—Messrs. Clarke, Thorpe, Urbain, and Ostwald—had expressed a wish to become incorporated with the International Association. Prof. Ostwald was requested by the Council to ask the existing members of the International Committee on Atomic Weights to draft statutes for the future organisation of this committee, and to submit these to the Council of the Association at its next meeting.

The Council next considered proposals for the further extension of the Association's activity.

Prof. Guye, who had pointed out the desirability of a uniform

abbreviation of titles of journals, was appointed by the Council to take preliminary steps for the attainment of this object.

Prof. Ostwald brought forward arguments in favour of the unification of the size of printed scientific literature in accordance with the views expressed in his pamphlet entitled, "Die Weltformate" (Ansbach, 1911). The Council thereupon unanimously expressed the hope that all Chemical Societies would issue their publications in the "Weltformat" $16 \times 22{\cdot}6$ cm. (these measurements referring to the cut copies), or in some form derived from this. The Council furthermore unanimously resolved that the publications of the Association should be issued in this form ($16 \times 22{\cdot}6$ cm.).

The suggestions by Prof. Ostwald concerning an international language called forth considerable discussion. The following suggestion was adopted unanimously:

"The Council should appoint a committee to investigate the question of the mitigation of the difficulties arising from the existing multiplicity of languages employed in scientific literature."

Each Society represented on the Council is to nominate a delegate on this committee, the organisation of which was entrusted to the Swiss delegate.

Finally, the Balance Sheet for the general expenses of the Association during the past year was adopted; the sum spent amounted to 1200 mk. (£60), or about 6—7 pf. (approximately $\frac{3}{4}d.$) per member of all the constituent Societies.

The next meeting of the Council will take place in England in the middle of September, 1913. Sir William Ramsay was elected President. The officers* of the Association are consequently the delegates of the Chemical Society (London), namely:

Sir William Ramsay, London,	President.
Prof. Percy F. Frankland, Birmingham,	Vice-President.
Prof. Arthur W. Crossley, London,	General Secretary.

who remain in office until the end of the next meeting.

W. Ostwald,
President until April, 1912.

H. Wichelhaus,
Vice-President until April, 1912.

P. Jacobson,
General Secretary until April, 1912.

* All communications should be addressed to:

Prof. A. W. Crossley,
Chemical Society,
Burlington House,
London, W.

APPENDIX I.

Statutes of the International Association of Chemical Societies

(according to the Resolutions of April 26, 1911, and April 11, 1912).

Art. I. Il est fondé une Association Internationale des Sociétés Chimiques.

Art. II. Le but de l'Association est de former un lien entre les Sociétés chimiques du monde, pour s'occuper des questions ayant un intérêt général et international pour la Chimie.

Art. III. Toutes les Sociétés chimiques peuvent faire partie de l'Association après un vote favorable du Conseil (comp. Art. IV). Le vote par correspondance est admis dans ce cas.

Art. IV. L'Association est dirigée par un Conseil formé d'un certain nombre de membres. Chaque pays ne peut être représenté dans le Conseil que par une seule Société chimique, qui désignera trois représentants.

Art. V. Le Conseil actuel comprend les délégués des Sociétés fondatrices, c'est-à-dire de la Société chimique allemande (Deutsche Chemische Gesellschaft), de la Société chimique anglaise (Chemical Society, London,) et de la Société chimique française (Société Chimique de France).

La représentation d'une autre Société dans le Conseil ne pourra être décidée que par celui-ci, et à la majorité des deux tiers des votants.

Art. VI. Le Conseil fixe à chaque réunion le lieu et l'époque de la prochaine session.

Art. VII. Le Conseil nomme au début de chaque session un Président, qui est en même temps Président de l'Association, et qui entrera en fonctions à la fin de la session.

Art. VIII. Le Bureau est constitué par le Président, le Vice-Président et le Secrétaire Général qui sont les délégués du même pays.

Art. IX. Le Président est chargé de convoquer le Bureau. Celui-ci veille à l'exécution des décisions prises par le Conseil; il fixe l'ordre du jour des Séances du Conseil et entretient des relations entre les diverses Sociétés. Le Président fait approuver les procés-verbaux des séances. Seul, le procès-verbal de la dernière séance peut être approuvé par correspondance.

Art. X. Les moyens d'action de l'Association consistent:

En nomination de Commissions chargées d'étudier les questions qui leur seront soumises par le Conseil;

En publication dans les journeaux des Sociétés affiliées ou en tout autre mode de publication qu'il conviendra au Conseil de choisir;

En conférences ou Congrès.

Art. XI. Les frais généraux seront supportés par les Sociétés affiliées au prorata du nombre de leurs membres.

Toutes les dépenses autres que les frais généraux ne seront imputables aux diverses Sociétés que sous réserve d'un engagement personnel de ces Sociétés.

Le Secrétaire Général soumettra à chaque session à l'approbation du Conseil le compte-rendu financier de l'exercice écoulé.

Art. XII. Toute modification aux status exigera la présence de la moitié au moins de la totalité des membres du Conseil. Les décisions seront prises à la majorité des deux tiers des membres votants.

Art. XIII. Excepté les cas prévus par les articles V et XII, tout vote émis par le Conseil sera valable à la majorité absolue des votants.

A égalité de voix, celle du Président est prépondérante.

APPENDIX II.

COMPOSITION OF THE NATIONAL COMMITTEES ON NOMENCLATURE.

I.—*For Inorganic Chemical Nomenclature.*

Deutsche Chemische Gesellschaft:

R. Lorenz (Chairman), Kettenhofweg 136, Frankfurt a M.
K. A. Hofmann, Witzlebenstrasse 26, Charlottenburg.
A. Rosenheim, Alsenstrasse 3, Berlin NW.

Chemical Society, London:

Sir William Ramsay (Chairman), 19 Chester Terrace, Regent's Park, London, N.W.
J. C. Cain, 24 Aylestone Avenue, Brondesbury Park, London, N.W.
A. Harden, 2 Marlborough Road, Richmond (Surrey).

Société Chimique de France *:

F. Bourion (Reporter), 21 rue Vauquelin, Paris.
V. Auger, 25 rue Humboldt, Paris.

* Messrs. A. Béhal, A. Haller, and M. Hanriot, the representatives of the Société Chimique de France on the Council of the International Association, are members of all the committees appointed by the Société Chimique de France.

R. de Forcrand, Montpellier.
M. Delépine, 2 rue Alphonse-Daudet, Paris.
P. Lebeau, 4 Avenue de l'Observatoire, Paris.
E. Rengade, 10 rue Daguerre, Paris.
G. Urbain, 69 Grande-Rue, à Bourg-la-Reine (Seine), Paris.

Schweizerische Chemische Gesellschaft:

A. Werner, Freie Strasse 111, Zürich.
V. Kohlschütter, Freie Strasse 3, Bern.

American Chemical Society:

J. L. Howe (Chairman), Wash. and Lee Univ., Lexington, Va.
Philip E. Browning, Kent. Chem. Lab., Yale University, New Haven, Ct.
E. C. Franklin, Hygienic Laboratory, Washington, D.C.
C. H. Herty, Univ. of N. C., Chapel Hill, N.C.
H. M. Patterson, Xenia, Ohio.
Owen Shinn, Dept. of Chemistry, Univ. of Penna., Phila., Pa.
A. L. Voge, Library of Congress, Washington, D.C.

Russian Chemical Society:

N. Kurnakow, Berg-Institut, St. Petersburg.
A. Gorboff, Chem. Laborat. of the Nicolai-Ingenieurakademie, St. Petersburg.
L. Tschugaeff, Chem. Laborat. of the University, St. Petersburg.

II.—*For Organic Chemical Nomenclature.*

Deutsche Chemische Gesellschaft:

P. Jacobson (Chairman), Sigismundstr. 4, Berlin W. 10.
C. Graebe, Westendstr. 28, Frankfurt a. M.
R. Pschorr, Humboldstr. 34, Berlin-Grunewald.
R. Stelzner, Regensburger Str. 11, Berlin W. 50.
J. Thiele, Goethestr., Chem. Institut, Strassburg i. Els.

Chemical Society, London:

W. P. Wynne (Chairman), The University, Sheffield.
J. C. Cain, 24 Aylestone Avenue, Brondesbury Park, London, N.W.
A. J. Greenaway, The Orchard, Chertsey, Surrey.
F. S. Kipping, University College, Nottingham.

Société Chimique de France*:

L. Maquenne (Chairman), 19 rue Sufflot, Paris.
G. Bertrand, 26 rue Dutoit, Paris.
E.-E. Blaise, Faculté des Sciences, Paris.
P. Freundler, 6 Place Denfert-Rochereau, Paris.
V. Grignard, Nancy.
R. Marquis, 10 rue Charles-Divry, Paris.
Ch. Moureu, 17 rue Sufflot, Paris.
M. Sommelet, 4 Avenue de l'Observatoire, Paris.
A. Valeur, 73 Boulevard Montparnasse, Paris.

Schweizerische Chemische Gesellschaft:

A. Pictet, Rue Bellot 13, Geneva.
Fr. Fichter, Neubadstr. 35, Bâle.

American Chemical Society:

M. T. Bogert (Chairman), Columbia University, New York.
Ira Remsen, John Hopkins Univ., Baltimore, Md.
M. Gomberg, Univ. of Mich., Ann Arbor, Mich.
C. S. Hudson, Bureau of Chemistry, Washington, D.C.
T. B. Johnson, Yale University, New Haven, Ct.
J. F. Norris, Simmons College, Boston, Mass.
W. A. Noyes, Univ. of Illinois, Urbana, Ill.
J. B. Tingle, McMaster Univ., Toronto, Canada.

Russian Chemical Society:

A. Faworsky, Chem. Laborat. of the University, St. Petersburg.
N. Zelinsky, Chem. Laborat. of the University, Moscow.
W. Ipatiew, Artillerieakademie, St. Petersburg.

ADDITIONS TO THE LIBRARY.

I. *Donations.*

[**Field**, *Frederick.*] A chemical review. By a B. pp. 25. London 1863. (*Reference.*) From Sir William Tilden, F.R.S.

Neumann, *Bernhard.* Lehrbuch der chemischen Technologie und Metallurgie. Leipzig 1912. pp. xii + 892. ill. M. 18.—. (*Recd.* 19/6/12.) From the Publisher: S. Hirzel.

* See footnote on p. 207.

III. *Pamphlets.*

Cross, *Charles Frederick.* Lectures on cellulose. pp. 52. London 1912.

Egypt, *Survey Department.* A report on the work of the Laboratories. By *A.* **Lucas.** pp. 26. Cairo 1912.

Gestewitz, *Kurt.* Beiträge zur Kenntniss der Verhaltens von Kohlenoxydblut zu gewissen fällenden Agentien. (From the *Zeitsch. exp. Path. Ther.*, 1911, 9.)

Herty, *Charles H.* Per cent. tables for oil in cottonseed products. With method of analysis. pp. 50. North Carolina 1908.

Hooper, *David.* The composition of Indian yams. (From the *J. Proc. Asiatic Soc. Bengal*, 1911, 7.)

—— Phosphorus in Indian foodstuffs. (From the *J. Proc. Asiatic Soc. Bengal*, 1911, 7.)

—— Some Asiatic milk-products. (From the *J. Proc. Asiatic Soc. Bengal*, 1911, 7.)

India. Report on the progress of agriculture in India for 1910–11. pp. 85. Calcutta 1912.

Ogilvie, *James P.* The determination of sucrose (cane sugar) in cane molasses by the double polarization method, using invertase and acid as hydrolysts. (From the *Int. Sugar J.*, 1912, 14.)

Patta, *Aldo,* and **Caccia,** *Piero.* Sul tetraioduro di para-amino-fenilarsenico. (From the *Boll. Soc. Med.-Chir. Pavia*, 1911.)

Polenske, *Ed.* Beiträge zum Nachweis der Benzoesäure in Nahrungs-und Genussmitteln. (From the *Arbeit. Kaiserl. Gesundheitsamte*, 1911, 38.)

Rossi, *G.* Su una nuova combinazione dell' exametilentetramina coll'acido ortoarsenico. (From the *Giorn. Farm. Chim.*, 1911, 60.)

Waidner, *C. W.*, and **Burgess,** *G. K.* On the constancy of the sulphur boiling point. (From the *Bull. Bureau of Standards*, 1911, 7.)

VACATION ARRANGEMENTS.

The Rooms of the Society will be closed for redecoration throughout the **month of August,** during which period the annual revision of the Library will take place.

Fellows are particularly requested to return all Library Books in their possession **not later than Wednesday, July 31st.**

LIST OF FELLOWS, 1912.

The List of Fellows for 1912 is now in active preparation, and changes of address received after July 31st cannot be included in it.

In order that the new List may be as complete as possible, those Fellows whose degrees and Christian names do not appear in full are requested to communicate them to the Assistant Secretary.

EIGHTH INTERNATIONAL CONGRESS OF APPLIED CHEMISTRY.

IMPORTANT NOTICE.

It does not appear to be generally understood that members of the Congress, even if not able to attend the meetings, are neverthe less entitled to a copy of the Proceedings, which it is intended by the Executive Committee shall be issued as promptly as possible.

All chemists are therefore invited to join the Congress, whether they intend proceeding to America or not. Membership can be completed on making application, accompanied by the subscription of £1, to Dr. M. O. Forster, 84, Cornwall Gardens, London, S.W., before July 24th, after which date such communications should be made to Mr. William J. Matheson, 182, Front Street, New York City, U.S.A.

BECQUEREL MEMORIAL LECTURE.

The Becquerel Memorial Lecture will be delivered by Sir Oliver Lodge at the opening meeting of the next Session to be held on October 17th, 1912. Further details will be announced in due course.

R. CLAY AND SONS, LTD., BRUNSWICK ST., STAMFORD ST., S.E., AND BUNGAY, SUFFOLK.

[*Issued* 16/11/12

PROCEEDINGS

OF THE

CHEMICAL SOCIETY.

Vol. 28. No. 405.

The Council has ordered the following letter and report to be printed in the Journal and Proceedings of the Society:

WHINFIELD,
SALCOMBE,
S. DEVON.
Sept. 16*th*, 1912.

GENTLEMEN,

I have the honour to forward the Annual Report of the International Committee on Atomic Weights for 1913, together with a Table of Atomic Weights, which are submitted for publication in the Society's Transactions and Proceedings, as hitherto.

The Report draws attention to all the atomic-weight determinations which have been published since the date of the preceding Report, but the only alteration suggested in the table which accompanied last year's Report is the inclusion of the element holmium, with Ho=163·5, as the result of the work of Holmberg.

I am, Gentlemen,
Your obedient Servant,
T. E. THORPE.

The Hon. Secretaries,
The Chemical Society,
Burlington House,
London, W.

Annual Report of the International Committee on Atomic Weights, 1913.

SINCE the annual report for 1912 was prepared, a number of important memoirs on atomic weights have appeared. There are also one or two earlier researches which were received too late to be noticed at the proper time. These investigations may be summarised as follows:

Nitrogen.—Wourtzel (*Compt. rend.*, 1912, **154**, 115), by oxidising NO to N_2O_4, has redetermined the ratio between nitrogen and oxygen. Five concordant measurements give, in mean, N = 14·0068.

Potassium and Chlorine.—Staehler and Meyer (*Zeitsch. anorg. Chem.*, 1911, **71**, 368) have made careful analyses of potassium chlorate, with special precautions against contamination by the chloride. Their final series gives KCl = 74·5551, whence K = 39·097 and Cl = 35·458. For a discussion of their results, see also Guye (*J. Chim. phys.*, 1912, **10**, 145), who concludes that the impurity above mentioned was, if not completely, at least sufficiently eliminated to be practically negligible.

Fluorine.—McAdam and Smith (*J. Amer. Chem. Soc.*, 1912, **34**, 592) have published two preliminary determinations of the atomic weight of fluorine. Sodium fluoride was converted into chloride by heating in dry, gaseous hydrochloric acid, and from the ratio between the weights the atomic weight was calculated. The two values found are: F = 19·0176 and 19·0133.

Phosphorus.—From analyses of phosphorus tribromide, Baxter, Moore, and Boylston (*Proc. Amer. Acad.*, **47**, 585; *J. Amer. Chem. Soc.*, 1912, **34**, 259) find, in mean of three series, P = 31·027 when Ag = 107·88. This agrees fairly well with the former work of Baxter and Jones on silver phosphate. Further work on phosphorus trichloride is promised.

Mercury.—Easley and Brann (*J. Amer. Chem. Soc.*, 1912, **34**, 137), by analyses of mercuric bromide, find Hg = 200·64. This confirms the previous work of Easley on the chloride.

Selenium.—Kuzma and Krehlik (*Trans. Bohemian Acad. of Emperor Francis Joseph*, 19, No. 13, 1910. Data furnished to the committee by Professor B. Brauner) have redetermined the atomic weight of selenium by reduction of SeO_2 with SO_2. The mean of ten determinations is Se = 79·26.

Tellurium.—Harcourt and Baker (Trans., 1911, **99**, 1311) have thrown doubt upon the work of Flint, who claimed to have split up the supposed element into two fractions of different atomic weight. They repeated his method of fractionation, and from the fourth fraction, found Te = 127·54. This agrees with the figure

found by Baker and Bennett in 1907. Similar fractionations have been carried out also by Pellini (*Atti R. Accad. Lincei*, 1912, [v], **21**, i, 218), who likewise failed to find any indication of a tellurium of low atomic weight.

Radium.—Hönigschmid (*Monatsh.*, 1912, **33**, 253), by careful analyses of relatively large quantities of radium chloride, finds Ra = 225·95. On the other hand, Whytlaw-Gray and Ramsay (*Proc. Roy. Soc.*, 1912, **86**, *A*, 270), using very small quantities of material, and converting the bromide into the chloride, find Ra = 226·36, in agreement with previous work by Madame Curie and Thorpe. Until the discordance between Hönigschmid's low value and the higher is explained, it is undesirable to change the figure given in the table.

Tantalum.—The determinations of this atomic weight by Chapin and Smith (*J. Amer. Chem. Soc.*, 1911, **33**, 1497) were made by the hydrolysis of $TaBr_5$. The mean of eight determinations gave Ta = 181·80, a figure somewhat higher than that found by Balke from similar analyses of the pentachloride.

Iridium.—Hoyermann (*Sitzungsber. phys. med. Soz. Erlangen*, **42**, 278), by five reductions of $(NH_4)_2IrCl_6$ in hydrogen, finds Ir = 192·613.

Holmium.—Six determinations of the atomic weight of holmium by Holmberg (*Zeitsch. anorg. Chem.*, 1911, **71**, 226), gave Ho = 163·45. The well known sulphate method was employed.

There are also approximate determinations of the atomic weights of lead, zinc, and copper by Pecheux (*Compt. rend.* 1912, **154**, 1419), and of calcium by Oechsner de Coninck (*Compt. rend.*, 1911, **153**, 1579). The figures obtained are not conclusive enough to justify their use in the table, for the methods employed were not of great accuracy.

Only one change is recommended in the table for 1913, namely, the insertion of holmium, for which, hitherto, no good atomic-weight determination has been available. Two or three other alterations of small importance might be made, but it seems undesirable to make changes too frequently.

(*Signed*)

F. W. Clarke.
T. E. Thorpe.
W. Ostwald.
G. Urbain.

1913.

International Atomic Weights.

		O=16.
Aluminium	Al	27·1
Antimony	Sb	120·2
Argon	A	39·88
Arsenic	As	74·96
Barium	Ba	137·37
Bismuth	Bi	208·0
Boron	B	11·0
Bromine	Br	79·92
Cadmium	Cd	112·40
Cæsium	Cs	132·81
Calcium	Ca	40·07
Carbon	C	12·00
Cerium	Ce	140·25
Chlorine	Cl	35·46
Chromium	Cr	52·0
Cobalt	Co	58·97
Columbium	Cb	93·5
Copper	Cu	63·57
Dysprosium	Dy	162·5
Erbium	Er	167·7
Europium	Eu	152·0
Fluorine	F	19·0
Gadolinium	Gd	157·3
Gallium	Ga	69·9
Germanium	Ge	72·5
Glucinum	Gl	9·1
Gold	Au	197·2
Helium	He	3·99
Holmium	Ho	163·5
Hydrogen	H	1·008
Indium	In	114·8
Iodine	I	126·92
Iridium	Ir	193·1
Iron	Fe	55·84
Krypton	Kr	82·92
Lanthanum	La	139·0
Lead	Pb	207·10
Lithium	Li	6·94
Lutecium	Lu	174·0
Magnesium	Mg	24·32
Manganese	Mn	54·93
Mercury	Hg	200·6

		O=16.
Molybdenum	Mo	96·0
Neodymium	Nd	144·3
Neon	Ne	20·2
Nickel	Ni	58·68
Niton (radium emanation)	Nt	222·4
Nitrogen	N	14·01
Osmium	Os	190·9
Oxygen	O	16·00
Palladium	Pd	106·7
Phosphorus	P	31·04
Platinum	Pt	195·2
Potassium	K	39·10
Praseodymium	Pr	140·6
Radium	Ra	226·4
Rhodium	Rh	102·9
Rubidium	Rb	85·45
Ruthenium	Ru	101·7
Samarium	Sa	150·4
Scandium	Sc	44·1
Selenium	Se	79·2
Silicon	Si	28·3
Silver	Ag	107·88
Sodium	Na	23·00
Strontium	Sr	87·63
Sulphur	S	32·07
Tantalum	Ta	181·5
Tellurium	Te	127·5
Terbium	Tb	159·2
Thallium	Tl	204·0
Thorium	Th	232·4
Thulium	Tm	168·5
Tin	Sn	119·0
Titanium	Ti	48·1
Tungsten	W	184·0
Uranium	U	238·5
Vanadium	V	51·0
Xenon	Xe	130·2
Ytterbium (Neoytterbium)	Yb	172·0
Yttrium	Yt	89·0
Zinc	Zn	65·37
Zirconium	Zr	90·6

The following are abstracts of papers received during the vacation, and published, or passed for publication, in the *Transactions*:

189. **"The essential oil of the leaves of Atherosperma moschatum ('Australian sassafras')."** **By Margaret Emilie Scott.** (Trans., 1912, 1612.)

The essential oil of *Atherosperma moschatum*, Labill., contains the following compounds in approximately the proportions indicated: eugenol methyl ether, 50—60 per cent.; pinene, 15—20 per cent.; camphor, 15—20 per cent.; and safrole, 5—10 per cent.

190. **"Harmine and harmaline. Part I."** **By William Henry Perkin, jun., and Robert Robinson** (Trans., 1912, 1775.)

A detailed description of work of which a preliminary account has already appeared (this vol., p. 153).

191. **"The chemistry of the glutaconic acids. Part V. The preparation of esters of the labile acids."** **By Norman Bland and Jocelyn Field Thorpe.** (Trans., 1912, 1557.)

The esters of those labile acids of the series which, by reason of the presence of a methyl group on the central carbon atom of the three-carbon system, possess considerable stability, can be prepared by the dissociation of their sodium compounds, provided that such a compound contains a potentially mobile hydrogen atom within its molecule.

Thus the action of sodium ethoxide on ethyl *iso*dehydracetate (I) yields the sodium compound (II), and, by further action, ethyl acetate and the sodium compound (III):

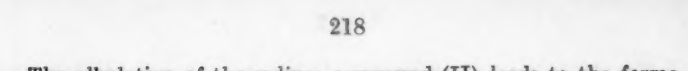
$$O\!<\!\begin{matrix}CMe{:}C(CO_2Et)\\ CO\text{———}CH\end{matrix}\!>\!CMe \longrightarrow \underset{(I.)}{\phantom{NaO\cdot CMe{:}C(CO_2Et)\cdot CMe{:}CH\cdot CO_2Et}}\quad \underset{(II.)}{NaO\cdot CMe{:}C(CO_2Et)\cdot CMe{:}CH\cdot CO_2Et}$$

$$\longrightarrow CH_3\cdot CO_2Et + \underset{(III.)}{NaO\cdot C(OEt){:}\overset{*}{C}H\cdot CMe{:}CH\cdot CO_2Et}.$$

This sodium compound contains a potentially mobile hydrogen atom (*); it therefore reacts with water, yielding the pure labile ester (IV). The corresponding normal ester (V) can be prepared by the esterification of the normal acid:

$$\underset{(IV.)}{CO_2Et\cdot CH{:}CMe\cdot CH_2\cdot CO_2Et} \qquad \underset{(V.)}{CO_2Et\cdot \overset{|}{C}H\cdot CHMe\cdot \overset{|}{C}H\cdot CO_2Et}$$

The alkylation of the sodium compound (II) leads to the formation of the labile esters of the dialkylated acids (VI):

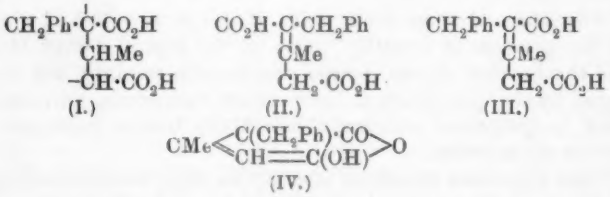


(I.) (VI.)

and by this means the labile forms of both $\alpha\beta$-dimethylglutaconic acid and of β-methyl-α-ethylglutaconic acid can be isolated.

192. "The chemistry of the glutaconic acids. Part VI. Conditions which confer stability on the *trans*-forms of the labile acids." By Norman Bland and Jocelyn Field Thorpe. (Trans., 1912, 1739.)

By increasing the weight of groups attached to the carbon atoms of the three-carbon system, sufficient stability is conferred on the labile state to render it capable of isolation in its *cis*- and *trans*-modifications; thus α-benzyl-β-methylglutaconic acid has been obtained as the normal form (I) melting at 148°, the *trans*-modification of the labile form (II) melting at 134°, and the unstable *cis*-modification of the labile form (III) which passes into the hydroxy-anhydride (IV) melting at 69°, when liberated from its salts:

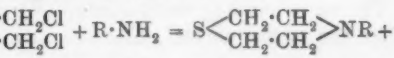


(I.) (II.) (III.)

(IV.)

193. "4-Alkyl-1 : 4-thiazans." By Hans Thacher Clarke. (Trans., 1912, 1583.)

Alkyl derivatives of the cyclic compound thiazan, or thiomorpholine, $S<\begin{matrix}C_2H_4\\C_2H_4\end{matrix}>NH$, in which the alkyl group is attached to the nitrogen atom, may be prepared by the interaction of $\beta\beta'$-dichloroethyl sulphide and primary amines:



The *methyl-*, *ethyl-*, iso*amyl-*, and *benzyl-thiazans*, together with characteristic derivatives, are described.

194. "**The triazo-group. Part XXI. Benzenoid azoimides containing multivalent iodine.**" **By Martin Onslow Forster and Johannes Heinrich Schaeppi.** (Trans., 1912, 1359.)

In order to ascertain whether any intramolecular action occurs between the azoimide nucleus and the iodoso- or iodoxy-group, the three iodophenylazoimides were prepared and converted into their respective triazophenyl iodochlorides, triazo-iodosobenzenes, triazo-iodoxybenzenes, and di-triazophenyliodinium iodides.

195. "**β-Hydroxy-$\alpha\beta$-dimethyladipic acid and β-hydroxy-$\alpha\alpha\beta$-trimethyladipic acid.**" **By Victor John Harding.** (Trans., 1912, 1590.)

When ethyl lævulate is condensed with ethyl α-bromopropionate by means of zinc in benzene solution, there is formed a mixture of diethyl β-hydroxy-$\alpha\beta$-dimethyladipate (I) and the ethyl ester of the lactone of β-hydroxy-$\alpha\beta$-dimethyladipic acid (II):

$$CO_2Et\cdot CHMe\cdot CMe(OH)\cdot CH_2\cdot CH_2\cdot CO_2Et$$
(I.)

$$\begin{matrix} CO\text{——}O \\ | \quad\quad | \\ CH_2\cdot CH_2 \end{matrix}\!\!>CMe\cdot CHMe\cdot CO_2Et$$
(II.)

A similar mixture of hydroxy-ester (III) and lactone (IV) is obtained by the condensation of ethyl lævulate and ethyl α-bromo-*iso*butyrate:

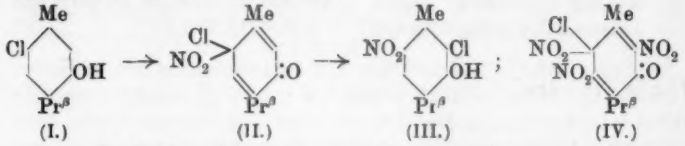
$$CO_2Et\cdot CMe_2\cdot CMe(OH)\cdot CH_2\cdot CH_2\cdot CO_2Et \qquad \begin{matrix} CO\text{——}O \\ | \quad\quad | \\ CH_2\cdot CH_2 \end{matrix}\!\!>CMe\cdot CMe_2\cdot CO_2Et$$
(III.) (IV.)

Acid hydrolysis results in the production of the lactonic acids. Attempts to prepare the unsaturated acids from the hydroxy-acids were without success.

196. "**The migration of the para-halogen atom in phenols.**" **By Philip Wilfred Robertson and Henry Vincent Aird Briscoe.** (Trans., 1912, 1964.)

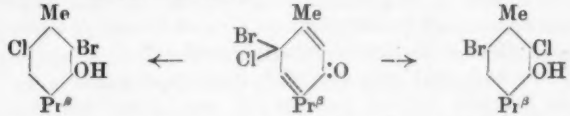
The observation that 6-bromothymol on nitration forms 2-bromo-6-nitrothymol (Robertson, *Trans.*, 1908, **93**, 793) has led the authors to investigate in more detail the cause of the migration of the halogen atom, and to extend the observations to other compounds. A similar migration takes place with 6-chlorothymol (I) on nitration. It seemed probable that an intermediate hemiquinonoid compound (II) is first formed, and actually the dinitro-derivative

of this substance (IV) has been isolated by the action of excess of nitrogen peroxide on 6-chlorothymol:



(I.) (II.) (III.) (IV.)

Not only is the nitro-group capable of causing a para-halogen atom to wander into the ortho-position, but also one halogen can cause another partly to migrate in the same manner, so that when 6-chlorothymol is brominated or 6-bromothymol is chlorinated a mixture of isomeric chlorobromothymols is obtained. These observations are easily explainable on the assumption of the intermediate formation of a hemiquinonoid compound, which yields two products, as indicated below:



Similar changes have been observed in the case of certain derivatives of 2:2′-diphenol; thus, 5:5′-dichloro-2:2′-diphenol and 5:5′-dibromo-2:2′-diphenol both yield on nitration compounds containing the halogen in the 3:3′-position.

197. **"The resolution of *sec.*-butylamine into optically active components." By William Jackson Pope and Charles Stanley Gibson.** (Trans., 1912, 1702.)

Externally compensated *sec.*-butylamine is readily resolved into its optically active components by crystallisation with *d*- and *l*-α-bromocamphor-π-sulphonic acids; a number of derivatives of the active bases have been prepared and characterised.

198. **"The relation between residual affinity and chemical constitution. Part III. Some heterocyclic compounds." By Hans Thacher Clarke.** (Trans., 1912, 1788.)

A series of compounds of the general formula $X<\begin{matrix}CH_2\cdot CH_2\\CH_2\cdot CH_2\end{matrix}>Y$, where X and Y are oxygen, nitrogen, or sulphur, has been examined. From a consideration of their chemical behaviour it is found that:

(1) the atoms X and Y exert a mutual influence, which affects their reactive power;

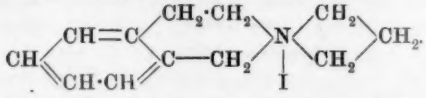
(2) when X and Y are atoms of the same element, the reactive power is abnormally great;

(3) when X and Y are atoms of different elements, the reactivity is abnormally small.

The refractive and dispersive powers, and the molecular volumes, of these and other compounds are recorded, but no definite conclusions could be drawn therefrom.

199. "**The configuration of substituted ammonium compounds.**" **By Humphrey Owen Jones and John Gunning Moore Dunlop.** (Trans., 1912, 1748.)

The paper describes the preparation and attempted resolution of a dicyclic quaternary ammonium compound, namely, *2-trimethylenetetrahydroisoquinolinium iodide*,



On the "pyramid" configuration for quinquevalent nitrogen compounds this substance should exist in enantiomorphous forms, but no evidence that it can exhibit optical activity was obtained.

It is also to be expected that α- and β-substituted pyridinium compounds and also quinolinium compounds would exhibit optical activity. A number of compounds belonging to these classes has been examined previously (*Trans.*, 1903, **83**, 1415; 1907, **91**, 117), and more recently Miss M. B. Thomas has examined others, but no evidence of resolution has been obtained. It would therefore appear desirable to suggest some hypothesis to account for the apparent non-existence of enantiomorphous forms in these cases.

It is suggested tentatively that a quaternary ammonium compound may be regarded as having the four alkyl groups arranged around a central nitrogen atom forming a group (Na_4), which possesses enough residual valency to unite with an electronegative radicle, forming a salt, Na_4X.

200. "**Hydrolysis of acetic anhydride.**" **By Kennedy Joseph Previté Orton and Marian Jones.** (Trans., 1912, 1708.)

The hydrolysis of acetic anhydride in various media, acetic acids of various concentrations, and aqueous acetone, has been investigated by the aid of the method of determining acetic anhydride previously described (Edwards and Orton, *Proc.*, 1911, **27**, 121). The results show that the hydrolysis of acetic anhydride is quite

analogous to its reactions with hydroxy- and amino-compounds, and to the hydrolysis of esters, amides, etc.

In anhydrous media, acids are very powerful catalysts of the hydrolysis, but in water they have but a feeble influence. In aqueous solutions, alkalis and alkaline salts are most effective. Nitric acid behaves exceptionally; in a medium containing 50 per cent. acetic acid or less, it has the normal catalytic effect. As the proportion of acetic acid is increased, its apparent activity decreases until in glacial acetic acid it is infinitesimal.

201. "Acetic anhydride. The pure material, its physical properties, and its reaction with bromine." By Kennedy Joseph Previté Orton and Marian Jones. (Trans., 1912, 1720.)

The complete separation of acetic anhydride from acetic acid can be effected by fractional distillation with a Young's "pear" still-head. The boiling point of the pure anhydride is 139·55°/760 mm., the specific gravity 1·0876 at 15°/4°, and 1·0820 at 20°/4°, and the refractive index for the line H^{α} 1·39311 at 9·5° and 1·39069 at 15°.

Landolt (*Ann. Phys. Chem.*, 1864, [ii], **122**, 556) is the only observer whose values for these constants are in close agreement with the authors'; the most delicate analysis of acetic anhydride, containing acetic acid, is given by the method of Orton and Edwards (*Trans.*, 1911, **99**, 1181).

Pure acetic anhydride is stable to bromine and chlorine in the dark, but rapid action occurs in the presence of traces of strong acids, ferric chloride, or iodine; aluminium chloride and other ferric salts are without effect. It is remarkable that the disappearance of the bromine is independent of the initial concentration, and directly proportional to the time and to the concentration of the catalyst. Addition of small quantities of water diminishes the activity of the catalyst except in the case of iodine.

202. "The action of sulphur on amines. Part I. *o*-Toluidine." By Herbert Henry Hodgson. (Trans., 1912, 1693.)

When *o*-toluidine is treated with sulphur in the presence of *o*-toluidine hydrochloride or free hydrochloric acid, the product appears to be entirely *trithio-o-toluidine*, which may be readily isolated by means of its sparingly soluble *hydrochloride*. The *sulphate*, *oxalate*, *acetyl*, and *benzoyl* derivatives have been prepared, and also the *m-nitrobenzylidene* and *bisazo-β-naphthol* derivatives.

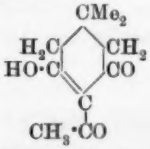
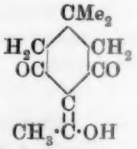
On reduction of the hydrochloride with zinc and hydrochloric acid, a mercaptan is produced which on oxidation furnishes *dithio-o-toluidine*, of which the *hydrochloride*, *sulphate*, *oxalate*, and *acetyl*, m-*nitrobenzylidene*, and *bisazo-β-naphthol* derivatives were prepared.

The bisazo-dyestuffs produced from trithio-*o*-toluidine are of remarkable fastness towards ordinary agents, particularly towards soap and alkalis.

203. "**Acyl derivatives of the dihydroresorcins. Part I. The action of hydroxylamine and of phenylhydrazine on *C*-acetyldimethyl- and *C*-acetyltrimethyl-dihydroresorcins.**" **By Arthur William Crossley and Nora Renouf.** (Trans., 1912, 1524.)

The behaviour of *C*-acetyldimethyl- and *C*-acetyltrimethyl-dihydroresorcin towards hydroxylamine and phenylhydrazine has been investigated with the object of gaining more definite information as to the constitution of these substances.

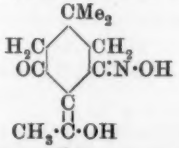
C-Acetyldimethyldihydroresorcin behaves as a monobasic acid, and may be represented by one or other of the following formulæ, probably the latter:

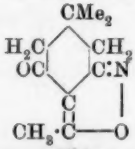



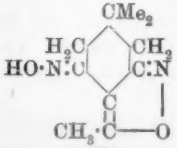
When acted on by hydroxylamine it gives an acid oxime (I), an *iso*oxazole (II), and an oxime of the *iso*oxazole (III), and with phenylhydrazine it behaves in a similar manner, giving an acid phenylhydrazone, a phenylpyrazole, and a phenylhydrazone of the phenylpyrazole.

C-Acetyltrimethyldihydroresorcin also gives an acid phenylhydrazone and a phenylpyrazole with phenylhydrazine, although all attempts to prepare a phenylhydrazone of the phenylpyrazole have so far failed.

Reasons are given in the paper for assuming that these two *C*-acetyl derivatives are similarly constituted:


(I.)


(II.)


(III.)

204. "**The influence of solvents on the rotation of optically active compounds. Part XVIII. The effect of inorganic salts on the rotation of ethyl tartrate in aqueous solution and in the homogeneous condition.**" **By Thomas Stewart Patterson and Duncan Geddes Anderson.** (Trans., 1912, 1833.)

205. "**The action of aliphatic amines on *s*-dibromosuccinic acid. Part. II. Allylamine.**" **By Edward Percy Frankland and Henry Edgar Smith.** (Trans., 1912, 1724.)

The authors have prepared a *diallylaminosuccinic acid*,

$$C_3H_5\cdot NH\cdot CH(CO_2H)\cdot CH(CO_2H)\cdot NH\cdot C_3H_5,$$

with properties similar to those of the dipropylamino- and dibutylamino-succinic acids previously obtained (*Trans.*, 1912, **101**, 57), and have prepared from it a *monohydrochloride*, and *mononitroso-* and *tetrabromo*-derivatives. The latter substance:

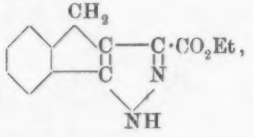
$$\begin{matrix} CH_2Br\cdot CHBr\cdot CH_2\cdot NH\cdot CH\cdot CO_2H \\ CH_2Br\cdot CHBr\cdot CH_2\cdot NH\cdot CH\cdot CO_2H' \end{matrix}$$

undergoes decomposition when heated with acids, water, or alcohol, $\alpha\beta$-dibromopropylamine or its salts being liberated, and one molecule of carbon dioxide evolved.

The authors propose to apply this reaction to other brominated alkylamino-compounds.

206. "**Studies on cyclic ketones. Part I.**" **By Siegfried Ruhemann.** (Trans., 1912, 1729.)

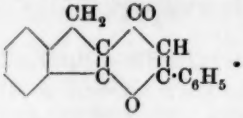
In connexion with the work on triketohydrindene hydrate and its methylenedioxy-derivative, the cyclic ketones have been subjected to a closer study with the object of transforming them into polycyclic systems. The action of ethyl oxalate on a number of cyclic ketones was examined, and ethyl α-hydrindoneoxalate, $C_6H_4<\begin{matrix}CH_2\\CO\end{matrix}>CH\cdot CO\cdot CO_2Et$, which is produced by this reaction, was condensed with hydrazine and phenylhydrazine to *ethyl* 4:5-*indenopyrazole*-3-*carboxylate*,



and its 1-*phenyl* derivative.

It was further found that α-hydrindone reacts with ethyl phenyl-

propiolate in the presence of sodium ethoxide, like acetone or acetophenone, and yields 6-*phenyl*-2:3-*indeno*-4-*pyrone*,



Attempts were also made to condense 1:3-dimethyl-Δ^3-*cyclo*hexen-5-one with *p*-nitrosodimethylaniline, with the result that an azomethine is not formed, but the nitroso-compound is reduced to tetramethyldiaminoazoxybenzene, whereas the ketone is probably oxidised to *m*-5-xylenol. This view is supported by the formation of ethyl Δ^1-*cyclo*hexene-3:6-dione-2:5-dicarboxylate on treatment of ethyl succinosuccinate with sodium carbonate and nitroso-dimethylaniline.

207. "**The bromination of phenol. 2:4- and 2:6-Dibromophenol.**" **By Frank George Pope and Arthur Samuel Wood.** (Trans., 1912, 1823.)

2:4-Dibromophenol is most rapidly prepared by the bromination of phenol in the presence of hydrobromic acid (D 1·49). The purified product melts at 40°, and has been characterised by conversion into its acetyl, benzoyl, and p-*nitrobenzoyl* derivatives and its methyl and *ethyl* ethers.

2:6-Dibromophenol can be obtained in good yields by the elimination of carbon dioxide from 3:5-dibromo-4-hydroxybenzoic acid. The acid may be obtained in about 90 per cent. yield by bromination of *p*-hydroxybenzoic acid in presence of sulphuric acid, and the carbon dioxide eliminated from the carboxyl group by heating the acid under pressure with dilute sulphuric acid, water, or bases. The authors are of the opinion that the reaction is ionic, since the rate of elimination of carbon dioxide is slower the greater the concentration of the mineral acid, and more rapid in the presence of bases. The resulting phenol was characterised by conversion into its nitro-derivative and into its *methyl* and *ethyl* ethers.

208. "**The action of halogens on silver salts and on potassium cyanate in presence of water, with a note on the decomposition of cyanic acid in aqueous solution.**" **By Charles William Blyth Normand and Alexander Charles Cumming.** (Trans., 1912, 1852.)

The halogens react with silver salts to yield a silver halide, an acid, and one or more oxidation products of either the acid or the

halide. The reactions, on account of secondary oxidations, are sometimes complex; for example, silver thiocyanate and iodine interact according to the equation:

$$14AgCNS + 7I_2 + 10H_2O = 14AgI + 12HCNS + 2H_2SO_4 + HCN + NH_3 + CO_2.$$

The oxidation reactions are much more marked with chlorine and bromine than with iodine.

The main product obtained by treatment of silver cyanate with iodine is carbamide, formed probably by secondary decomposition of cyanic acid. Bromine and silver cyanate yield ammonium bromide, carbamide, cyanuric acid, and a little nitrogen.

For comparison, the action of bromine on potassium cyanate was studied, and found to be in accord with the equation:

$$4KCNO + 4H_2O + 3Br_2 = 4KBr + 2NH_4Br + N_2 + 4CO_2.$$

It is suggested that the reactions are due to interactions between the silver salts and the products of the hydrolysis of the halogen by water; thus, a silver salt reacts with the chloridions formed by partial hydrolysis of chlorine:

$$Cl_2 + H_2O = H^{\cdot} + Cl' + HClO.$$

Further interaction may occur between the hypochlorous acid and one of the reaction products. The experimental results are in accord with this hypothesis.

In connexion with the formation of carbamide, some experiments on the decomposition of aqueous cyanic acid were tried, and these in conjunction with previous work led to the conclusion that cyanic acid decomposes in three different ways according to the conditions of experiment.

209. "The refraction and dispersion of triazo-compounds. Part II."
By James Charles Philip. (Trans., 1912, 1866.)

From the results of the earlier investigation (*Trans.*, 1908, **93**, 918) and the data recorded in the present paper, the figure 8·91 is deduced as the most probable refraction value (*D*-line) for the N_3-group in ordinary positions. The corresponding dispersion value ($H_\gamma - H_\alpha$) is 0·348. In the case of *o*-triazoiodobenzene and αγ-bis-triazopropylene, two compounds in which the N_3-group is attached to a doubly-linked carbon atom, there is distinct enhancement of the optical values. This observation is in harmony with what was found in the earlier work.

An incidental refractometric investigation of the *o*-dihalogen derivatives of benzene shows the superiority of Eisenlohr's newer values for atomic refraction as compared with the older figures for these constants.

210. "The action of acyl chlorides on primary amides." By Arthur Walsh Titherley and Thomas Halstead Holden. (Trans., 1912, 1871.)

Whilst by long heating acetyl chloride acetylates benzamide, benzoyl chloride only gives very small yields of dibenzamide (decreasing with rising temperature) and large quantities of benzonitrile and benzoic acid at 140°. The action of benzoyl chloride on *p*-toluamide was studied in order to elucidate the mechanism of the reaction, which has been shown to follow two courses, involving the normal and pseudo-amide forms, namely:

$$A.\quad Ar\cdot CO\cdot NH_2 \xrightarrow{Ph\cdot COCl} Ar\cdot CO\cdot NH\cdot COPh$$

$$B.\quad Ar\cdot C(OH){:}NH \xrightarrow{Ph\cdot COCl} Ar\cdot C(O\cdot COPh){:}NH \longrightarrow Ar\cdot CN + Ph\cdot CO_2H.$$

In addition to the above products, benzonitrile is also formed in quantities which are relatively great when equimolecular proportions of *p*-toluamide and benzoyl chloride are taken, but small when an excess of amide is used. Its production has been traced to the decomposition of the secondary amide under the catalytic influence of hydrogen chloride, yielding a mixture of acids and a mixture of nitriles. This action is prevented by fixation of the hydrogen chloride when an excess of amide is used owing to the formation of amide hydrochloride. An important further secondary reaction is that between the amide hydrochloride and hydrogen chloride, yielding at 140° an acyl chloride and ammonium chloride, thus:

$$Ar\cdot CO\cdot NH_2,HCl \xrightarrow{HCl} Ar\cdot COCl + NH_4Cl.$$

In the reaction between benzoyl chloride and *p*-toluamide, therefore, *p*-toluamide hydrochloride, ammonium chloride, *p*-toluoyl chloride, benzoic and *p*-toluic acids, benzonitrile, *p*-toluonitrile, and benzo-*p*-toluamide (and probably di-*p*-toluamide) are formed.

211. "The action of benzotrichloride on primary amides." By Arthur Walsh Titherley and Thomas Halstead Holden. (Trans., 1912, 1881.)

Salicylamide on heating with benzotrichloride readily condenses, yielding *o*-benzoyloxybenzonitrile (75 per cent. of theory), together with small quantities of *N*-benzoylsalicylamide. The mechanism of this change has been elucidated by the study of the action of benzotrichloride on acetamide, benzamide, and *p*-toluamide. The first product of the change is the nitrile and benzoyl chloride, which in the latter cases enters into further action on the amide, yielding a secondary amide and benzoic acid, as shown by the authors (preceding abstract). Since with *p*-toluamide, benzo-

trichloride may under certain conditions yield benzonitrile along with *p*-toluonitrile (which is the main constituent when an excess of *p*-toluamide is used), as well as *p*-toluoyl chloride, two distinct condensation reactions appear to be involved when benzotrichloride acts on an aromatic amide, in which the normal and pseudo-forms participate, probably thus:

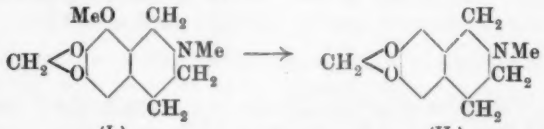
A. $Ar{\cdot}CO{\cdot}NH_2 \xrightarrow{PhCCl_3} Ar{\cdot}CO{\cdot}NH{\cdot}CCl_2Ph \xrightarrow{-HCl} Ar{\cdot}CO{\cdot}N{:}CPhCl \xrightarrow{\text{split}} Ar{\cdot}COCl + Ph{\cdot}CN$

B. $Ar{\cdot}C(OH){:}NH \xrightarrow{PhCCl_3} Ar{\cdot}C(O{\cdot}CCl_2Ph){:}NH \longrightarrow Ar{\cdot}CN + Ph{\cdot}COCl$

The first reaction is favoured by the presence of hydrogen chloride on account of the formation of the amide hydrochloride, $Ar{\cdot}CO{\cdot}NH_2,HCl$, which tends to react as in *A*, whilst the free amide tends to react as in *B*; and hence this reaction is favoured by an excess of *p*-toluamide. When three molecular proportions of the latter and one of benzotrichloride react at 140°, the chief products are *p*-toluamide hydrochloride, benzo-*p*-toluamide, *p*-toluonitrile, *p*-toluic acid, and benzoic acid. When equimolecular proportions are employed, the chief products are *p*-toluoyl chloride, benzoyl chloride, *p*-toluonitrile, and benzonitrile.

212. "*iso*Quinoline derivatives. Part VII. The preparation of hydrastinine from cotarnine." By Frank Lee Pyman and Frederic George Percy Remfry. (Trans., 1912, 1595.)

Hydrocotarnine (I) is converted into hydrohydrastinine (II) in a yield amounting to about 40 per cent. of the theoretical by the action of sodium and alcohol:



(I.) (II.)

Since hydrocotarnine is readily obtained by the reduction of cotarnine, and, on the other hand, hydrohydrastinine yields hydrastinine on oxidation, the latter alkaloid can now be prepared from cotarnine. Besides hydrohydrastinine, the following bases have been isolated from the products of the action of sodium and alcohol on hydrocotarnine: 6-*hydroxy*-2-*methyltetrahydro*isoquinoline, 7-*hydroxy*-2-*methyltetrahydro*isoquinoline, 6-*hydroxy*-8-*methoxy*-2-*methyltetrahydro*isoquinoline, and 7-*hydroxy*-8-*methoxy*-2-*methyltetrahydro*isoquinoline.

213. **"The rate of reaction of alkyl haloids with certain tertiary bases."** **By Richard William Dades Preston and Humphrey Owen Jones.** (Trans., 1912, 1930.)

The authors have studied the rate of combination of certain organic haloids (methyl, ethyl, *n*-propyl, and allyl iodides, *o*-, *m*-, and *p*-xylyl bromides, and *p*-bromobenzyl bromide) with two tertiary amines (dimethylaniline and tri*iso*amylamine) in absolute alcohol solution at 40° and in two cases at 25°.

The results show that the ratio of the velocity-constants for the haloids is (with one exception) practically independent of the nature of the tertiary amine, and that the relative reactivities of the xylyl bromides are in the order which would be expected from a consideration of the distribution of affinity in the molecule after the manner adopted by Flürscheim.

The rate of the reaction was measured by precipitating and weighing silver haloid. It has also been shown that change of conductivity of the solution can be used to measure the rate of the reaction.

214. **"Derivatives of *o*-hydroxyazobenzene."** **By John Theodore Hewitt and William Henry Ratcliffe.** (Trans., 1912, 1765.)

The authors have combined various substituted benzenediazonium salts with *p*-acetylaminophenol. During the progress of the work, Voroschtsoff (*J. Russ. Phys. Chem. Soc.*, 1911, **43**, 787) described *m*-acetylamino-*o*-hydroxyazobenzene (m. p. 226°) and its conversion into *o*-hydroxyazobenzene; his results are fully confirmed. In the following table the bases diazotised are given in the first column, the melting points of the azo-compounds produced on combining with *p*-acetylaminophenol in the second:

o-Chloroaniline	199—200°	*p*-Bromoaniline	222—223°
m-Chloroaniline	206—207	*o*-Nitroaniline	216—217
p-Chloroaniline	217—218	*m*-Nitroaniline	231—233
o-Bromoaniline	206—208·5	*p*-Nitroaniline	235
m-Bromoaniline	217—218		

p-Benzoylaminophenol was found to melt at 216—217°, benzoylaminophenyl benzoate at 235°, these figures substantially agreeing with those given by Reverdin. The former compound gives benzeneazo- and *p*-nitrobenzeneazo-compounds, which melt at 201° and 267—268° respectively.

215. "The absorption spectra of nitro-compounds." By John Theodore Hewitt, Frank George Pope, and Winifred Isabel Willett (Trans., 1912, 1770.)

The authors compare the absorption of benzoic acid and its *p*-bromo- and *p*-nitro-derivatives with their sodium salts. In each case salt-formation is accompanied by only slight diminution of the oscillation frequency, and the same holds good for phenylacetic acid and its nitrile. In all these cases the possibility of quinonoid change is precluded, but when alkali is added to *p*-nitrophenylacetonitrile a deep purple colour is produced and a radical change in absorption spectrum occurs. Similar, although less marked, changes are observed in the case of ethyl *p*-nitrophenylacetate and *p*-nitrophenylacetic acid. Attention is drawn to the possibility of quinonoid rearrangement taking place according to the scheme:

$$NO_2 \cdot C_6H_4 \cdot CH_2 \cdot CN \longrightarrow NaNO_2 : C_6H_4 : CH \cdot CN.$$

216. "A study of some dicyclic quaternary ammonium compounds." By John Gunning Moore Dunlop. (Trans., 1912, 1998.)

1 : 1-Trimethylenepiperidinium hydroxide, obtained by the action of silver oxide on 1 : 1-trimethylenepiperidinium bromide,

$$CH_2\!<\!\begin{matrix}CH_2\cdot CH_2\\CH_2\cdot CH_2\end{matrix}\!>\!NBr\!<\!\begin{matrix}CH_2\\CH_2\end{matrix}\!>\!CH_2,$$

yields on distillation γ-hydroxypropylpiperidine,

$$C_5H_{10}N \cdot CH_2 \cdot CH_2 \cdot CH_2 \cdot OH,$$

together with traces of piperidine.

Marckwald and Frobenius (*Ber.*, 1902, **34**, 3557) stated that the product of the action of heat on β-chloroethylpiperidine,

$$C_5H_{10}N \cdot CH_2 \cdot CH_2Cl,$$

is 1 : 1-ethylenepiperidinium chloride,

$$CH_2\!<\!\begin{matrix}CH_2\cdot CH_2\\CH_2\cdot CH_2\end{matrix}\!>\!NCl\!<\!\begin{matrix}CH_2\\CH_2\end{matrix}.$$

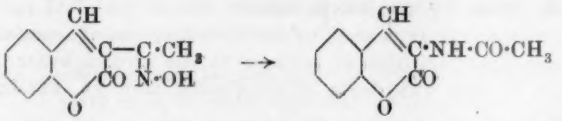
This is shown to be incorrect, the product being really diethylenedipiperidine dichloride,

$$C_5H_{10}N\!<\!\begin{matrix}CH_2\cdot CH_2\\CH_2\cdot CH_2\end{matrix}\!>\!NC_5H_{10}\cdot \quad \begin{matrix}\\Cl\end{matrix} \qquad \begin{matrix}\\Cl\end{matrix}$$

217. "3-Aminocoumarin." By Frank William Linch. (Trans. 1912, 1578.)

3-Acetylaminocoumarin was prepared by the condensation of salicylaldehyde with glycine, or more advantageously from the

oxime of 3-acetylcoumarin by means of the Beckmann transformation:



It crystallises in white, silky needles, melting at 201°, and on hydrolysis gives *3-aminocoumarin*, which forms cream-coloured needles melting at 130°. This compound behaves as if it possessed the imino-structure; for example, nitrous acid gives an *isonitroso*-compound, and on hydrolysis 3-ketocoumarin is produced, with the liberation of ammonia.

7-Bromo-3-acetylcoumarin, prepared by the condensation of 5-bromosalicylaldehyde with ethyl acetoacetate, forms pale yellow needles melting at 217°; the *oxime* decomposes at 220°.

7-Bromo-3-acetylaminocoumarin, prepared from the above oxime by means of the Beckmann reaction, crystallises from most organic solvents in needles melting at 266°. On acid hydrolysis it gives *7-bromo-3-aminocoumarin*, which forms pale cream-coloured needles melting at 205°.

218. "**Studies in the azine series. Part II.**" **By Kathleen Balls, John Theodore Hewitt, and Sidney Herbert Newman.** (Trans., 1912, 1840.)

The question of the ortho- or para-quinonoid nature of the safranines has been examined, and several reactions lead to the detection of only one amino-group at a time in the phenosafranine molecule (monacid salts); thus not only can one amino-group alone be diazotised in solutions of medium acid concentration, but phenosafranine condenses with one molecule of benzaldehyde; whilst tetramethylsafranine unites with one molecule of methyl iodide.

The absorption spectra of several derivatives of phenylphenazonium have been measured.

219. "**Properties of mixtures of allyl alcohol, water, and benzene. Part II.**" **By Thomas Arthur Wallace and William Ringrose Gelston Atkins.** (Trans., 1912, 1958.)

Pure allyl alcohol has D^{0}_{0} 0·86911 and boils at 97·06°. It forms the following mixtures of constant boiling point:

Alcohol, per cent.	Benzene, per cent.	Water, per cent.	Boiling point.
72·00	—	28·00	88·00°
17·36	82·64	—	76·75
9·16	82·26	8·58	68·21

The alcohol when mixed with water shows a large, and with *n*-propyl alcohol a slight, contraction in volume; with benzene, however, there is a small expansion.

The above data show that by distillation of the aqueous alcohol, and subsequent addition of benzene to the alcohol–water binary mixture, a pure anhydrous allyl alcohol may be obtained in quantity.

220. "Some new diazoamino- and *o*-aminoazo-compounds." **By George Marshall Norman.** (Trans., 1912, 1913.)

Aminoazo-compounds have been obtained from 4:4′-dibromo- and 4:4′-dichloro-diazoaminobenzene by heating these compounds at 65° with excess of the corresponding amine and one molecule of its hydrochloride.

4:4′-*Dibromo-2-aminoazobenzene*, $C_6H_4Br\cdot N_2\cdot C_6H_3Br\cdot NH_2$, forms red needles, m. p. 146—147°.

4:4′-*Dichloro-2-aminoazobenzene* forms bright red plates with a green reflex, m. p. 140°.

3:3′-*Dibromodiazoamino-p-toluene*,

$$CH_3\cdot C_6H_3Br\cdot N_3H\cdot C_6H_3Br\cdot CH_3,$$

crystallising in yellow needles, m. p. 111°, could not be transformed into an azo-compound by heating with 3-bromo-*p*-toluidine and its hydrochloride.

β-Naphthalenediazoamino-p-chlorobenzene, $C_6H_4Cl\cdot N_3H\cdot C_{10}H_7$, crystallises in dark yellow needles, m. p. 156°.

β-Naphthalenediazoamino-*p*-toluene, when heated with *p*-toluidine and its hydrochloride, gave a good yield of *p*-tolueneazo-β-naphthylamine.

o-Tolueneazo-β-naphthylamine, $CH_3\cdot C_6H_4\cdot N_2\cdot C_{10}H_6\cdot NH_2$, forms long, dark red needles, m. p. 122°. It is produced either by the action of *o*-toluenediazonium chloride on β-naphthylamine, or by the action of β-naphthalenediazonium chloride on *o*-toluidine.

m-*Tolueneazo-β-naphthylamine* is produced by the action of *m*-toluenediazonium chloride on β-naphthylamine. It crystallises in small, orange-red needles, m. p. 102°.

By the action of β-naphthalenediazonium chloride on *m*-toluidine there is produced in small quantity *β-naphthalenediazoamino*-m-*toluene*, $CH_3\cdot C_6H_4\cdot N_3H\cdot C_{10}H_7$, which crystallises in thin, yellow plates, m. p. 183°.

The action of nitrous acid on the azo-compounds, and of β-naphthol on some of the diazoamino-compounds mentioned, has also been studied.

221. **"The alkaline condensations of nitrohydrazo-compounds. Part II."** By **Arthur George Green and Frederick Maurice Rowe.** (Trans., 1912, 2003.)

When bisnitrobenzeneazo-azobenzene (dinitrotrisazobenzene),

$$NO_2 \cdot C_6H_4 \cdot N_2 \cdot C_6H_4 \cdot N_2 \cdot C_6H_4 \cdot N_2 \cdot C_6H_4 \cdot NO_2,$$

is reduced with phenylhydrazine and sodium hydroxide, it is converted into *tetrakisazobenzene,*

$$\begin{matrix} N \cdot C_6H_4 \cdot N_2 \cdot C_6H_4 \cdot N \\ \| \qquad\qquad\qquad\qquad \| \\ N \cdot C_6H_4 \cdot N_2 \cdot C_6H_4 \cdot N \end{matrix}.$$

This is a red, granular substance of high melting point, which is the nitrogen analogue of Mikado-orange, and like this dyestuff it dissolves in concentrated sulphuric acid with a pure blue colour. The analogy between the condensations which give rise to bisnitrobenzeneazo-azobenzene and those by which the stilbene dyestuffs are formed, is thus confirmed.

As a by-product in the reduction there is also produced the bisaminobenzeneazo-azobenzene,

$$NH_2 \cdot C_6H_4 \cdot N_2 \cdot C_6H_4 \cdot N_2 \cdot C_6H_4 \cdot N_2 \cdot C_6H_4 \cdot NH_2,$$

recently described by Witt and Kopetschni (*Ber.*, 1912, **45**, 1147). This crystallises from xylene in garnet-red crystals, which melt at 294°.

222. **"The absorption spectra of simple aliphatic substances in solutions, vapours, and thin films. Part I. Saturated aldehydes and ketones."** By **John Edward Purvis and Nial Patrick McCleland.** (Trans., 1912, 1810.)

A comparative study of the absorption spectra of various simple aliphatic aldehydes and ketones has been made in order to determine in what direction, and how far, the absorption of light is affected when they are in different physical conditions. The phenomena are discussed from a consideration of the vibrations having their primary oscillations originating in definite oscillation centres.

223. **"The influence of certain salts on the dynamic isomerism of ammonium thiocyanate and thiocarbamide."** By **William Ringrose Gelston Atkins and Emil Alphonse Werner.** (Trans., 1912, 1982.)

In continuation of the work already published (*Trans.*, 1912, **101**, 1167), experiments have been made in the hope of obtaining evidence likely to throw further light on the reversible isomerism

of the above two compounds. The action of heat on the compounds $(CsN_2H_4)_4,KI$, m. p. 189°, $(CsN_2H_4)_4,CsI$, m. p. 191°, and $(CsN_2H_4)_4RbI$, m. p. 202°, has been studied; in each case the equilibrium percentage of thiocarbamide was lowered, as compared with the normal 25 per cent. It was found to be about 14 per cent. in the case of the potassium iodide compound, and about 16 per cent. with the other two.

The influence of the chlorides, bromides, and iodides of potassium, sodium, and ammonium on the reversion of thiocarbamide and ammonium thiocyanate at 170° has been studied; sodium iodide differs from the other salts by effecting an almost complete reversion of thiocarbamide.

The action of heat on the compound $(CsN_2H_4)_3,KSCN$ has also been examined; in this case the normal equilibrium was not disturbed.

Several new additive compounds of thiocarbamide with saline iodides have been prepared for comparative study. Whilst tetramethylammonium iodide does not form a compound with thiocarbamide, the additive compound $(CsN_2H_4)_2,NMe_3EtI$, m. p. 141°, was readily obtained.

224. "The molecular condition of some organic ammonium salts in bromoform." By William Ernest Stephen Turner. (Trans., 1912, 1923.)

In continuation of the author's investigation (*Trans.*, 1911, **99**, 880), the molecular complexities of twelve salts of organic ammonium bases have been determined in bromoform. The results confirm the author's previous conclusions based on the use of chloroform as a solvent, and indicate that these salts are strongly associated, the extent depending on the character of the salt, on the concentration of the solution, and on the solvent employed.

Association in bromoform is even more pronounced than in chloroform, and the conclusion is drawn that the probable cause is to be traced to the lower dielectric constant of bromoform. The effect of the solvent on the molecular weight differs, however, from salt to salt.

225. "The action of sodium methoxide on 2:3:4:5-tetrachloropyridine. Part II." By William James Sell. (Trans., 1912, 1945.)

The action of sodium methoxide on 2:3:4:5-tetrachloropyridine has been studied on a fairly large scale at the ordinary pressure

in a flask heated by immersion in a water-bath, the experiments being conducted in two series, namely, (1) in which the sodium methoxide solution was of moderate strength, the main product being 3:5-dichloro-2:4-dimethoxypyridine; no methyl ether was produced. (2) In which the sodium methoxide was of such strength as to solidify on cooling, and the only products were 3:5-dichloro-4-hydroxy-2-methoxypyridine and methyl ether. The methyl ether is believed to be the product of the further action of sodium methoxide on the pyridine methoxide first produced, thus:

(a) $RCl + CH_3 \cdot ONa = NaCl + RO \cdot CH_3$.

(b) $RO \cdot CH_3 + CH_3 \cdot ONa = RONa + (CH_3)_2O$.

Some evidence is adduced as to the constitution of the chief products of this reaction, and it is indicated that at a temperature below the boiling point of water the 4-methoxy-group in the 3:5-dichloro-2:4-dimethoxy-compound is converted into the hydroxy-group, but that it requires a considerably higher temperature to effect the conversion of the methoxy-group in the 2-position.

226. "The preparation of glycogen and yeast-gum from yeast." By Arthur Harden and William John Young. (Trans., 1912, 1928.)

The method previously described for the preparation of pure glycogen from yeast (*Trans.*, 1902, **81**, 1224) has been simplified by adopting the procedure of Pflüger for the preliminary extraction and purification. By the process described, glycogen is obtained which contains no nitrogen and only 0·02 per cent. of ash. From the filtrate, after removal of the glycogen, yeast-gum is obtained as a white powder dissolving in water to a clear solution, which gives no red colour with iodine, produces a bulky, flocculent precipitate when warmed with Fehling's solution, and yields mannose when hydrolysed by boiling with acid.

227. "Studies of Chinese wood oil. β-Elæostearic acid." By Robert Selby Morrell. (Trans., 1912, 2082.)

Further investigation of the glyceride produced when Chinese wood oil is exposed to light seemed advisable in view of the diversity of opinion as to the structure of elæostearic acid. The results obtained confirm many of the statements of previous investigators. β-Elæostearic acid (m. p. 72°) and its glyceride (m. p. 61—62°) are stereoisomerides of α-elæostearic acid (m. p. 48°) and its liquid glyceride. With the exception of the potassium salt, the derivatives of the acid absorb oxygen with great rapidity, and in several

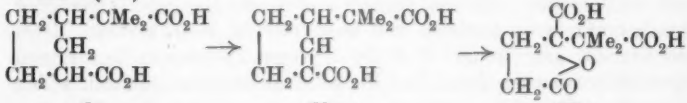
cases it was impossible to prevent oxidation before analysis. Oxidation of the potassium salt by alkaline permanganate gave *n*-valeric and azelaic acids, together with substances showing the pyrrole reaction. Tartaric and succinic acids could not be detected among the oxidation products. Ethyl β-elæostearate (b. p. 232°/14 mm.) undoubtedly contains only two doubly-linked carbon atoms. The reactions of elæostearic acid are best expressed by the constitutional formula proposed by Majima (*Ber.*, 1909, **42**, 674), namely,

$$CH_3\cdot[CH_2]_3\cdot CH{:}CH\cdot[CH_2]_2\cdot CH{:}CH\cdot[CH_2]_7\cdot CO_2H,$$

Preliminary investigations of the action of oxygen and air on the salts of β-elæostearic acid have shown that the gain in weight depends on the nature of the salt. During the oxidation of the glyceride a change from crystalline to spongy character occurs without alteration in colour. If the temperature is raised to 100° there is a sudden change in colour and oxidation products (aldehydes and acids) are expelled.

228. "The constitution of camphene. Part I. The structure of camphenic acid." By Walter Norman Haworth and Albert Theodore King. (Trans., 1912, 1975.)

Aschan (*Annalen*, 1910, **375**, 336) ascribes to camphenic acid the constitution (I); to dehydrocamphenic acid (II); and to the product of the oxidation of this with nitric acid, the lactonic acid formula (III):



(I.) (II.) (III.)

By the aid of a Reformatsky condensation between ethyl α-ketoglutarate and ethyl α-bromo*iso*butyrate, the authors have synthesised a lactonic acid having the constitution represented by (III), which, however, is not identical with the lactonic acid obtained by Aschan by the oxidation of dehydrocamphenic acid. Consequently, some modification of the above accepted structure (I) for camphenic acid must be adopted.

229. "Studies in phototropy and thermotropy. Part III. Aryldeneamines." By Alfred Senier, Frederick George Shepheard, and Rosalind Clarke. (Trans., 1912, 1950.)

The effect of light on the Schiff's bases, which are phototropic at the ordinary temperature, has been studied at temperatures up

to their melting points, and some bases which are not phototropic at the ordinary temperature have been submitted to the action of light at lower temperatures in order to find out if they might not exhibit phototropy under such conditions. In the first case it has been found that whilst some Schiff's bases are phototropic at temperatures up to their melting points, others have a limiting temperature, above which they are not phototropic; secondly, of the compounds examined at lower temperatures, two, namely, salicylidene-*p*-anisidine and *2-hydroxy-3-methoxybenzylidene*-p-*xylidine*, were found to be phototropic.

The colour changes which take place in salicylidene-β-naphthylamine (Senier and Shepheard, *Trans.*, 1909, **95**, 1950) have been further investigated, and it has been found that this compound is phototropic at the ordinary temperature, but that the darker phototrope only changes very slowly into the lighter one. Salicylidene-β-naphthylamine, similar to some other anils of this series, can be obtained in two forms, yellow and red, by varying the method of preparation, and it is now shown that these modifications are identical with the light and dark phototropes.

To the list of phototropic Schiff's bases already known, the following compounds have been added: *salicylidene*-o-*anisidine*, *disalicylidene*-m-*phenylenediamine*, and *2-hydroxy-3-methoxybenzylidene*-p-*xylidine*, which have not hitherto been described, and salicylideneaniline, salicylidene-*o*-bromoaniline, salicylidene-*p*-bromoaniline, and salicylidene-*p*-anisidine, already described, but with no mention hitherto of their phototropic properties.

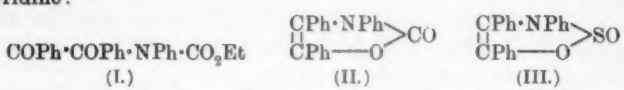
230. "Studies of the constitution of soap in solution: sodium myristate and sodium laurate." By James William McBain, Elfreida Constance Victoria Cornish, and Richard Charles Bowden. (Trans., 1912, 2042.)

The anomalous conductivity curve for sodium palmitate at 90° is closely paralleled by that of the very much more mobile sodium myristate solutions. The curve for sodium laurate is much less anomalous in that the maximum and minimum are obliterated. Only the degree, and not the position, of the abnormality in the curves is altered in passing down the homologous series from stearate to laurate. The conductivity curves of sodium myristate at a number of temperatures between 90° and 40° reveal a very high temperature-coefficient, which, however, is nearly uniform for all concentrations, so that the position and degree of development of maximum and minimum is largely unaffected. Finally, a number of qualitative observations closely bearing on the colloid theory of

soap solutions and "supersaturation" of gelatinisation are discussed. The coagulation of a suspensoid or gelatinisation of an emulsoid does not appear to be connected with change in the degree of dispersion of the colloid in certain cases.

231. "The condensation of α-keto-β-anilino-αβ-diphenylethane and its homologues with ethyl chlorocarbonate and thionyl chloride." By Hamilton McCombie and John Wilfred Parkes. (Trans., 1912, 1991.)

Some of the acyl derivatives of α-keto-β-anilino-αβ-diphenylethane were found by Everest and McCombie (*Trans.*, 1911, **99**, 1746) to undergo condensation with ammonia to yield glyoxalines. In continuation of this work, the authors have prepared the carbethoxy-derivatives of α-keto-β-anilino-αβ-diphenylethane (I) and its homologues. The carbethoxy-compound (I), when heated with ammonia in a sealed tube, was found to yield 2-keto-3:4:5-triphenyl-2:3-dihydro-oxazole (II), the ammonia merely acting as a hydrolysing agent. It was found that this oxazole could be prepared more conveniently from the carbethoxy-compound by the action of alcoholic potassium hydroxide, or directly from α-keto-β-anilino-αβ-diphenylethane by the action of carbonyl chloride in presence of pyridine:



(I.) (II.) (III.)

The dihydro-oxazoles, which have been prepared, are found to be very stable towards acids and alkalis, they resist the action of reducing agents, and are not sufficiently basic to form salts.

The reaction between thionyl chloride and α-keto-β-anilino-αβ-diphenylethane and its homologues was also investigated. In this case, the compounds obtained (III) were analogous to the oxazoles described above, having the CO-group replaced by the SO-group. The authors suggest the name oxasulphinazole for this new heterocyclic ring, so that compound (III) would be 3:4:5-triphenyloxasulphinazole.

Like the oxazoles, the oxasulphinazoles were found to be extremely unreactive.

Attempts were also made to substitute sulphuryl chloride for thionyl chloride in this reaction, but no ring compounds were obtained, only chloro-derivatives of the original α-keto-β-anilino-αβ-diphenylethane being produced.

232. "**Carbon disulphide as solvent for the determination of the 'refraction constant.'**" **By Frédéric Schwers.** (Trans., 1912, 1889.)

Some new experiments have been made on the density and refractive index of binary mixtures, and the results calculated according to the formula which was theoretically explained in previous papers.

Measurements were made with mixtures of carbon disulphide with aliphatic acids (acetic, *iso*butyric, *iso*valeric) and alcohols (ethyl and *iso*butyl), and the refraction constant "A" was calculated and compared with the value for the corresponding solutions in water. Some differences are to be noted between the two kinds of solutions, namely, (1) there occurs a dilatation of both density and refractive index in the case of carbon disulphide mixtures, and not a contraction as in the case of aqueous solutions; (2) the absolute values of "A" are much smaller than for the corresponding solutions in water; moreover, there does not exist an absolute proportionality between these A-values in carbon disulphide and aqueous solutions. On the other hand, solutions in carbon disulphide have important points in common with those in water, namely, (1) by comparing solutions of carbon disulphide with the different terms of a series, it appears that "A" diminishes with the increase of the molecular weight; (2) increase of temperature produces increase of "A"; (3) the refraction constant diminishes from the red to the violet end of the spectrum.

233. "**The electrochemistry of solutions in acetone. Part II. The silver nitrate concentration cell.**" **By Alexander Roshdestwensky and William Cudmore McCullagh Lewis.**

Employing a more sensitive form of capillary electrometer, further measurements have been carried out on the *E.M.F.* of concentration cells containing silver nitrate in acetone. The *E.M.F.* values were found not to be affected by the interposition of a silver nitrate solution of arbitrary concentration; and taking this into account along with results previously obtained, the conclusion is drawn that the Nernst formulæ are applicable. On this basis the transport numbers of the ions of silver nitrate in acetone have been calculated.

Measurements have also been carried out with saturated ammonium acetate as the middle liquid.

234. "The influence of neutral solvents on velocity of reaction. Part II. Transformation of anis*syn*aldoxime in various solvents." By Thomas Stewart Patterson and Harvey Hugh Montgomerie.

The influence of neutral solvents on the velocity of transformation of anis*syn*aldoxime into anis*anti*aldoxime has been studied, the transformation being rendered apparent by a corresponding alteration in the rotation of ethyl tartrate used as an indicator.

235. "The condensation of pentaerythritol with aldehydes." By John Read. (Trans., 1912, 2090.)

The condensation products of pentaerythritol with a number of aldehydes have been made and investigated with a view to their resolution into enantiomorphously related isomerides.

236. "The interaction of iodine and thiocarbamide. The properties of formamidine disulphide and its salts." By Emil Alphonse Werner.

Iodine and thiocarbamide interact in presence of an ionising solvent in accordance with the equation:

$$2CSN_2H_4 + I_2 \rightleftarrows NH_2\cdot C(:NH)\cdot S_2\cdot C(:NH)\cdot NH_2,2HI$$

Formamidine disulphide hydriodide.

The amount of the hydriodide of the base produced is inversely proportional to the concentration of the products when equilibrium is established, and directly proportional to the ionising power of the solvent. In presence of nitric acid a quantitative yield of the dinitrate, $C_2S_2N_4H_6,2HNO_3$, is obtained. Three final results can be realised under different conditions, namely, (1) quantitative formation of formamidine disulphide, (*a*) with concentrated solutions of the components, (*b*) in a high degree of dilution, and (2) a condition of equilibrium in which the base and thiocarbamide are present in equivalent proportions, $C_2S_2N_4H_6 : 2CSN_2H_4$. An additive compound, $(CSN_2H_4)_2I_2$, is formed only when iodine and thiocarbamide are allowed to interact in presence of benzene or chloroform. It melts at 87°, and when brought in contact with water, or other ionising solvent, is converted into formamidine disulphide hydriodide (m. p. 81°).

Claus' compound, $(CSN_2H_4)_2Cl_2$ (*Annalen*, 1875, **179**, 139), is the hydrochloride of the base.

The *picrate* (m. p. 154°), *platinichloride*, and the *compound* $C_2S_2N_4H_6,2HI,I_2$ are described.

The action of potassium iodide in increasing the dissociation of the hydriodide, with generation of thiocarbamide and iodine, has been examined, and its influence on the estimation of thiocarbamide by $N/10$-iodine solution is pointed out. The production of formamidine disulphide by oxidising agents, such as potassium permanganate, nitrous acid, and hydrogen peroxide on thiocarbamide, only takes place in presence of strong acids, whilst with iodine the base is produced just as readily in neutral solution. An explanation of the probable mechanism of the interaction is given, which accounts for the formation of the base by the action of iodine under conditions different from those necessary with the oxidising agents mentioned.

237. **"The action of nitrous acid on thiocarbamide and on formamidine disulphide. A new structural formula of thiocarbamide." By Emil Alphonse Werner.**

When nitrous acid and thiocarbamide interact, the change proceeds in two different directions according as a weak or a strong acid is present.

In the presence of a weak acid the interaction is expressed by the equation $CSN_2H_4 + HONO = HSCN + N_2 + 2H_2O$, as proposed by A. E. Dixon (*Trans.*, 1892, **61**, 526), with a strong acid present, formamidine disulphide, $C_2S_2N_4H_6$ (Storch, *Monatsh.*, 1890, **11**, 452), is first produced thus:

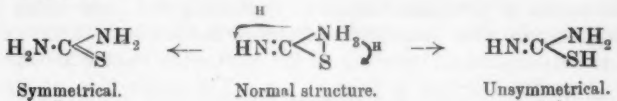
$$2CSN_2H_4 + 2HONO = C_2S_2N_4H_6 + 2NO + 2H_2O,$$

and this is decomposed by further action of nitrous acid with production of thiocyanic acid and evolution of nitrogen. The changes have been studied quantitatively, and the secondary reactions, which takes place to a small extent in both cases, have been explained.

Thiocarbamide can be used for the rapid and accurate assay of nitrites. To account for the different phenomena described, neither the symmetrical nor the unsymmetrical formula of thiocarbamide is sufficient, but a new formula, $HN{:}C\!<\!\begin{matrix}NH_2\\ |\\ S\end{matrix}$, is proposed, as probably representing the true structure of thiocarbamide in a neutral solution, or in presence of a weak acid.

This formula shows a much closer connexion between thiocarbamide and ammonium thiocyanate than the other two, and readily explains how the compound may give rise to derivatives of the symmetrical or unsymmetrical structure, under different conditions,

by the migration of an atom of hydrogen in either of the directions shown below:



Symmetrical. (*b*.) Normal structure. (*a*.) Unsymmetrical. (*c*.)

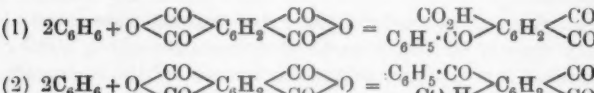
The change from (*a*) to (*c*) is determined by the presence of a strong acid or other strong negative reagent.

238. "The oxidation of some benzyl compounds of sulphur. Part I." By John Armstrong Smythe. (Trans., 1912, 2076.)

The comparative study of a number of benzyl compounds of sulphur has been undertaken. Oxidation is carried out with hydrogen peroxide in solution of glacial acetic acid. The simple monosulphidic compounds are converted quantitatively into higher oxy-derivatives, but the polysulphidic compounds suffer rupture. Benzyl disulphide yields benzyl disulphoxide, benzylsulphonic acid, benzaldehyde, and sulphuric acid, and the last three are among the products of reaction of benzyl disulphoxide, benzyl mercaptan, and benzoyl benzyl sulphide. An explanation of this peculiarity is sought in the hydrolysis of the disulphoxide and subsequent reaction of the hydrolytic products.

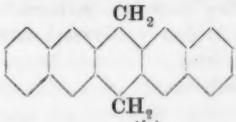
239. "The synthetical production of derivatives of dinaphthanthracene." By William Hobson Mills and Mildred Mills.

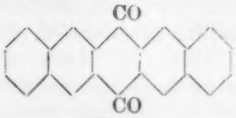
Under the influence of aluminium chloride, pyromellitic anhydride condenses with benzene, forming a mixture of 2:5-*dibenzoylterephthalic acid* and 4:6-*dibenzoylisophthalic acid*, as shown by the following equations:



The constitution of these acids has been established by fusion with potassium hydroxide, which decomposes them into benzoic acid, on the one hand, and terephthalic and *iso*phthalic acids respectively on the other. When warmed with concentrated sulphuric acid, both of these acids lose two molecules of water and give rise to *dinaphthanthradiquinone*, $C_6H_4<\begin{matrix}CO\\CO\end{matrix}>C_6H_2<\begin{matrix}CO\\CO\end{matrix}>C_6H_4$.

This diquinone when reduced with zinc dust and alkali is converted into *dihydrodinaphthanthracene* (I); when heated with hydriodic acid and phosphorus it gives rise to two isomeric *α*- and *β-tetrahydrodinaphthanthracenes*.


(I.)


(II.)

α-Tetrahydrodinaphthanthracene on oxidation is converted successively into dihydrodinaphthanthracene (I), *dinaphthanthrone*, $C_{10}H_6<\begin{matrix}CO\\CH_2\end{matrix}>C_{10}H_6$, and *dinaphthanthraquinone* (II). The constitution of dinaphthanthraquinone is established by the fact that it is decomposed by sodium hydroxide into a mixture of benzoic and β-naphthoic acids.

240. "The preparation of durylic and pyromellitic acids." By William Hobson Mills.

The conditions are specified under which acetyl-ψ-cumene, which can readily be obtained in any quantity from ψ-cumene by the Friedel-Crafts reaction, can be converted easily and with a satisfactory yield into pyromellitic acid. The process consists in the transformation of the ketone by sodium hypobromite into durylic acid, and the subsequent oxidation of the latter with potassium permanganate.

241. "Organic derivatives of silicon. Part XV. The nomenclature of organic silicon compounds." By Frederic Stanley Kipping.

Some suggestions are made for systematising the nomenclature of different types of silicon compounds, more especially those described in the following papers.

242. "Organic derivatives of silicon. Part XVI. The preparation and properties of diphenylsilicanediol" By Frederic Stanley Kipping.

The hydrolysis of pure dichlorodiphenylsilicane under various conditions has been studied, and it has been found that the isolation of diphenylsilicanediol, $SiPh_2(OH)_2$, from the product is an exceptionally difficult task, partly owing to the readiness with which

the diol undergoes condensation, giving compounds which it adsorbs from solutions.

Pure diphenylsilicanediol usually decomposes with effervescence at about 128—132°, but it is dimorphous, and in the neighbourhood of its decomposition point it may pass into a more stable, crystalline modification, which does not decompose and effervesce until about 150—160°; this change seems to occur always when the crystals of the diol contain relatively small quantities of some of its condensation products, but seldom takes place when the compound is pure, so that impure specimens appear to have a much higher decomposition point than the pure substance.

The isomeric "diphenylsilicols" described by Martin (*Ber.*, 1912, **45**, 403) as melting at about 140° and 160° respectively were probably impure specimens of diphenylsilicanediol, and the methods which he gave for the conversion of these supposed isomerides into one another do not bring about any isomeric change.

243. "Organic derivatives of silicon. Part XVII. Some condensation products of diphenylsilicanediol." By Frederic Stanley Kipping.

Diphenylsilicanediol very readily undergoes condensation in presence of acids or alkalis, and in the preparation of the diol from dichlorodiphenylsilicane by different methods, various oily or glue-like products are obtained in considerable quantities. These products are usually mixtures of three or more compounds, which are formed from the diol by a process of condensation, and of which the following four have so far been isolated:

$HO{\cdot}SiPh_2{\cdot}O{\cdot}SiPh_2{\cdot}OH$ (I.)
Anhydrobisdiphenylsilicanediol.

$HO{\cdot}SiPh_2{\cdot}O{\cdot}SiPh_2{\cdot}O{\cdot}SiPh_2{\cdot}OH$ (II.)
Dianhydrotrisdiphenylsilicanediol.

$O\langle{}^{SiPh_2{\cdot}O}_{SiPh_2{\cdot}O}\rangle SiPh_2$ (III.)
Trianhydrotrisdiphenylsilicanediol.

$O\langle{}^{SiPh_2{\cdot}O{\cdot}SiPh_2}_{SiPh_2{\cdot}O{\cdot}SiPh_2}\rangle O.$ (IV.)
Tetra-anhydrotetrakisdiphenylsilicanediol.

The conditions under which these four condensation products are obtained from the diol have been studied, and also methods for the conversion of the two hydroxy-compounds (I and II) into their respective anhydro-derivatives (IV and III). The results of these and of further experiments which are in progress may throw some light on the constitutions of the complex mineral silicates.

244. **"Organic derivatives of silicon. Part XVIII. Dibenzylsilicanediol and its anhydro-derivative." By Robert Robison and Frederic Stanley Kipping.**

The further study of the compounds described as α-dibenzylsilicol and β-dibenzylsilicol (*Trans.*, 1908, **93**, 441) has shown that the former is a dibenzylsilicanediol of the constitution

$$Si(CH_2 \cdot C_6H_5)_2(OH)_2,$$

whereas the latter is an *anhydrobisdibenzylsilicanediol* of the constitution $HO \cdot Si(CH_2 \cdot C_6H_5)_2 \cdot O \cdot Si(CH_2 \cdot C_6H_5)_2 \cdot OH$, crystallised with one molecule of water; although, therefore, the two compounds have the same composition they are not isomeric.

Dibenzylsilicanediol is the primary product of the hydrolysis of dichlorodibenzylsilicane, and methods for the preparation of the pure diol are described. When heated, or when treated with various reagents, dibenzylsilicanediol undergoes condensation, yielding products from which anhydrobisdibenzylsilicanediol and trianhydrotrisdibenzylsilicanediol may be isolated, the former in hydrated crystals. These hydrated crystals lose their water at 100°, and give anhydrobisdibenzylsilicanediol as a viscid oil, which is so very hygroscopic that it passes into the hydrated crystals on exposure to moist air.

245. **"Organic derivatives of silicon. Part XIX. The preparation and properties of some silicanediols of the type $SiR_2(OH)_2$." By Robert Robison and Frederic Stanley Kipping.**

Phenylethylsilicanediol, $SiPhEt(OH)_2$, *benzylethylsilicanediol*, $SiEt(CH_2 \cdot C_6H_5)(OH)_2$, and *phenylbenzylsilicanediol*,

$$SiPh(CH_2 \cdot C_6H_5)(OH)_2,$$

may be obtained by carefully hydrolysing the corresponding disubstituted dichlorosilicanes with an aqueous solution of ammonium hydroxide. These three crystalline compounds, like diphenylsilicanediol and dibenzylsilicanediol, give soluble derivatives with solutions of the alkali hydroxides; they are all very easily changed by heat and also by various reagents, giving oils which are doubtless mixtures of their condensation products.

Anhydrobisphenylethylsilicanediol, $HO \cdot SiPhEt \cdot O \cdot SiPhEt \cdot OH$, is formed when purified phenylethylsilicanediol is kept at the ordinary temperature, and also when an aqueous solution of the last-named compound is treated with a very little dilute hydrochloric acid.

246. "The purification, density, and expansion of ethyl acetate." By John Wade and Richard William Merriman.

Defects in the methods of preparing dry esters, used by previous workers, are pointed out and overcome. The density at 0° compared with water at 4° was found to be 0·92454, which is higher than the values obtained by Perkin (*Trans.*, 1884, **45**, 492), and by Young and Thomas (*Trans.*, 1893, **63**, 1216). Reasons for this difference are given.

Taking the specific volume at 0° to be unity, the specific volumes at 10°, 20°, and 30° were found to be 1·01301, 1·02663, and 1·04080 respectively. A method of using a Dewar vacuum vessel as a constant-temperature bath is described.

247. "The vapour pressure of ethyl acetate from 0° to 100°." By John Wade and Richard William Merriman.

For temperatures above 15° the boiling point of ethyl acetate was determined at constant pressure in the manner previously described by the authors (*Trans.*, 1911, **99**, 989). At each pressure a complete fractionation of 100 grams of pure ester was made, the temperature recorded being that at which Δ per cent. was a maximum (Wade, *Trans.*, 1905, **87**, 1656). At 100° the pressure found was 1536 mm., as compared with 1515 mm. obtained by Young and Thomas (*Trans.*, 1893, **63**, 1216). Reasons are advanced for regarding the new value as correct.

Below a pressure of 900 mm. the agreement with Young and Thomas is almost perfect. A new method was used for finding the vapour pressures below 15°.

248. "Halogen derivatives and 'refraction constant.'" By Frédéric Schwers.

The anomalies with regard to the "refraction constant" shown by mixtures containing a halogen derivative have been submitted to a closer investigation. It appears that the irregular behaviour (as compared with other mixtures) of the C_v and C_n curves is related to the number of halogen atoms, and affects the density much more than the refractive index, which shows more regularity. Particularly curious are the mixtures alcohol–chloroform and acetone–chloroform; their density variations are positive for certain concentrations and negative for others, whereas the refraction changes in quite a different manner and in the most regular way. Interesting is the fact that mixtures of

halogen derivatives with fatty acids do not show the same phenomena. For the explanation of the observed phenomena, the hypothesis of an atom nucleus with variable volume (Richards) seems more necessary than ever.

The following communication has been received during the vacation:

249. "Bimolecular glycollaldehyde. A correction." By Nial Patrick McCleland.

The author regrets that a mistake was allowed to pass unnoticed in the above paper (*Trans.*, 1911, **99**, 1827):

On p. 1829, line 17, for $C = \frac{M-60}{60}$ should be read $C = \frac{M-60}{M/2}$.

With this alteration the values of k become:

(i) 0·00140 not 0·00210.
(ii) 0·00196 „ 0·00303.
(iii) 0·00381 „ 0·00561.

the variation from the mean value in only one instance exceeding 4 per cent.

This alteration in no way affects the conclusions arrived at in the paper.

At an Extra Meeting of the Chemical Society, held in the Large Theatre of Burlington House (by the kind permission of His Majesty's Office of Works) on Thursday, October 17th, 1912, at 8.30 p.m., Professor Percy F. Frankland, LL.D., F.R.S., President, in the Chair, Sir Oliver Lodge, D.Sc., F.R.S., delivered the Becquerel Memorial Lecture.

A vote of thanks to Sir Oliver Lodge, proposed by Sir William Crookes, O.M., F.R.S., and seconded by Professor H. E. Armstrong, F.R.S., was supported by the President and carried with acclamation.

Thursday, November 7th, 1912, at 8.30 p.m., Professor Percy F. Frankland, LL.D., F.R.S., President, in the Chair.

The President referred to the loss sustained by the Society through death:

On August 7th, 1912, of Mr. Robert Holford MacDowall Bosanquet, F.R.S. (who was elected a Fellow on February 2nd, 1865);

On August 15th, 1912, of Dr. H. O. Jones, F.R.S.; and of Dr. John Wade.

The PRESIDENT read the following Address, which had been presented to the Royal Society on the celebration of the 250th Anniversary of its Foundation in July, 1912:

THE CHEMICAL SOCIETY

TO

THE PRESIDENT, COUNCIL, AND FELLOWS OF THE ROYAL SOCIETY.

GREETING,

Amongst the many Learned Bodies represented here to-day there is certainly none which can wish to offer you more sincere and heartfelt congratulations than the Chemical Society.

The Officers, Council, and Fellows of our Society desire to associate themselves with you in celebrating the Two-hundred-and-fiftieth Anniversary of the birth of a scientific corporation which in the distinction of its history is assuredly second to no similar body in the World. The great army of diligent and determined workers who are united by the solemn covenant to extend Man's knowledge of Nature look with reverence and gratitude on the Society which, during two and a-half centuries, has kept alive in these Islands the sacred fire of Research, and has included within its Fellowship men whose names and achievements are amongst the most imperishable glories of the human race.

We desire to take this opportunity of expressing, however imperfectly, our indebtedness to the Society of *Boyle*, of *Cavendish*, of *Priestley*, of *Dalton*, and of *Davy*, and we are proud to remember that these early masters of our Science, by the stimulus which their investigations gave to the growth of Chemical Knowledge, led to the origin of our Society by a natural process of gemmation from your body. It is, therefore, in the capacity of children, and as an act of filial piety, that we desire to offer to you, our parents, dutiful felicitations to-day.

We would take this opportunity again of gladly and freely acknowledging before all men that whatever success our own Society may have achieved, whatever may be the dignity to which we have attained, and whatever service to Science and to Mankind we may have been privileged to perform, we largely owe to the

inspiration which our founders drew from the magnificent traditions of the Royal Society. This quickening influence has been, and, we trust, may long be, maintained by a close association with you, by the community of Fellowship which exists between your Society and ours, and by the kindred ideals and aspirations which animate us both.

Signed on behalf of the Chemical Society,

PERCY F. FRANKLAND, *President.*
ALEXANDER SCOTT, *Treasurer.*
ARTHUR W. CROSSLEY, } *Secretaries.*
SAMUEL SMILES, }
HORACE T. BROWN, *Foreign Secretary.*

Sealed in Council this Twentieth Day of June, One Thousand Nine Hundred and Twelve.

It was announced that, during the vacation, the rooms of the Society had been redecorated throughout, and that a fan had been installed with the object of securing more efficient ventilation in the Meeting Room.

Messrs. T. V. Barker and W. E. Hawkins were formally admitted Fellows of the Society.

Certificates were read for the first time in favour of Messrs.:

James Henry Young Baker, 86, Chestnut Avenue, Hamilton, Ontario.

Douglas Anderson Bowack, 15, Belsize Square, Hampstead, N.W.

Richard Westman Challinor, Quidington, Emmerick Street, Leichardt, Sydney, N.S.W.

Frank Andrew Coombs, Sydney Technical College, Sydney, N.S.W.

Walter Henry Dixon, 51, High Street, East Grinstead.

H. H. Dodds, M.Sc., Explosives Works, Umbogintwini, Natal.

George Davidson Elsdon, B.Sc., City Analysts' Laboratory, Birmingham.

Harold Heath Gray, B.Sc., University Hall, More's Gardens, Cheyne Walk, Chelsea, S.W.

Ardesir Naserwanji Peston Jamas, M.A., B.Sc., Karrim Building, Grant Road, Bombay.

Edgar Jobling, B.Sc., H.M. Patent Office, Southampton Buildings, W.C.

Frederick Russell Lankshear, B.A., M.Sc., Dalton Hall, Victoria Park, Manchester.

Stanley Isaac Levy, B.A., B.Sc., St. John's College, Cambridge.

Ernest Lawson Lomax, M.Sc., Mowbreck, Farington, Preston.

George Francis Morrell, Ph.D., B.Sc., 7, Claylands Road, Kennington Gate, S.W.

Ernest Moore Mumford, B.Sc., 75, High Street, Chorlton-on-Medlock, Manchester.

Leslie Frank Newman, B.A., Downing College, Cambridge.

William Moore Nichols, 17, Ferrybridge Road, Castleford.

Maximilian Nierenstein, Ph.D., 30, Cavendish Road, Henleaze, Bristol.

Lionel Orange, B.Sc., 148, Barkworth Road, N. Camberwell, S.E.

John William Patterson, 88, Park Road, West Dulwich, S.E.

Charles Etty Potter, B.Sc., 9, Church View, Church Lane, Heckmondwike.

Jitendra Nath Rakshit, 11/1, Bahar Urijapur Road, Calcutta.

Martin Remers, L.R.C.P., L.R.C.S., 24, Chorley Old Road, Bolton.

Albert Sasson, Department of Agriculture, Alexandria, Egypt.

Harold Archibald Scarborough, B.Sc., 60, Highbury Terrace, Hill Street, Coventry.

Walter Scott, 2, Wordsworth Avenue, Cardiff.

Kunjo Behary Seal, 5, Nilmony Dutt Lane, Calcutta.

Cyril Edgar Sladden, B.A., 12, Charleville Circus, Sydenham, S.E.

Thomas Alfred Smith, B.Sc., 3, Colegrave Street, Lincoln.

William Charles Smith, Church Lane, Lowton, Newton-le-Willows.

Victor Steele, 438, New Cross Road, New Cross, S.E.

Alfred Ernest Stephen, Bank of New South Wales, Sydney, N.S.W.

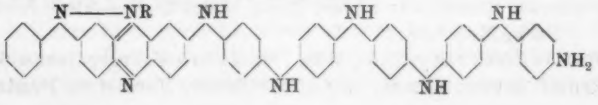
William Compton Till, M.Sc., Barnacle House, Coventry.

Paul Jenner Ure, c/o Dr. Ure, George Street, Brisbane, Queensland.

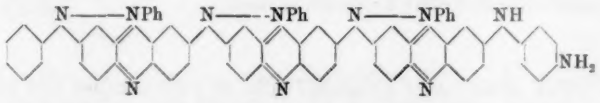
Of the following papers, those marked * were read:

*250. "Aniline-black and allied compounds. Part III." By Arthur George Green and Salomon Wolff.

The authors have studied the action of various primary amines on nigraniline. They find that this base, when in a finely-divided state, reacts readily in the cold with neutral or weakly acid solutions of amine salts, giving compounds in which one molecule of amine has entered into combination with one molecule of nigraniline. The products obtained are represented as monoarylazonium compounds of the constitution:



In their formation a portion of the quinonoid groups has undergone reduction, and the product resembles protoemeraldine in character, although considerably blacker in colour. By treatment with hydrogen peroxide or chromic acid, by which the compound is reoxidised to a higher (probably tri-) quinonoid stage, it is enabled to react again with a further quantity of a primary amine; and on several repetitions of these alternate treatments three molecules of amine can eventually be introduced. At this stage the product (when aniline is the amine employed) has all the properties characteristic of "ungreenable aniline-black" produced on the fibre in the usual way. The analyses and properties agree with the constitution:



By employing *p*-bromoaniline in place of aniline, the corresponding tribrominated aniline-black, of very similar properties to the above, was obtained, the analysis of which substantiated the above formula.

Monoarylazonium compounds were also prepared and analysed, in which the reacting amines were *o*-toluidine, *p*-toluidine, *m*-bromoaniline, β-naphthylamine, tolidine, and diaminodiphenylmethane. All these products are very similar to the aniline condensation product.

***251. "The alkaline condensation of nitrohydrazo-compounds. Part III. Influence of ortho-groups on their formation and condensation." By Arthur George Green and Frederick Morris Rowe.**

The presence of sulpho- or nitro-groups in the ortho-position with respect to basic nitrogen prevents or impedes the normal reactions; thus 2:4-dinitroaniline and *p*-nitroanilinesulphonic acid cannot under ordinary conditions be oxidised to the azo-compounds, nor can their corresponding hydrazines be condensed with chloronitro-compounds to give hydrazo-compounds, except with the extremely reactive picryl chloride. A search for the cause of this impeding action, which is the exact reverse of that observed in the derivatives of *p*-nitrotoluene, pointed to its being due to the occurrence of condensation between the basic nitrogen group and the *o*-nitro- or *o*-sulphonic group. This was confirmed by the observation that when *o*-nitroaniline is oxidised with hypochlorites in alkaline solution it is converted entirely into benz*iso*oxadiazole (benzfurazan)

oxide ("dinitrosobenzene") (see following abstract), whilst the normal oxidation to 2:2′-dinitroazobenzene only occurs when strictly neutral conditions are maintained, that is, when isomerisation of the nitroamine into its quinonoid form is prevented.

A similar condensation appears to occur when the hydrazo-compounds containing *o*-nitro-groups are treated with alkalis, and consequently the blue quinonoid salts of these compounds are very unstable. The conditions of formation and reaction were studied for the following azo- and hydrazo-compounds: The 2:2′-dinitro-, 2:4:2′:4′-tetranitro- and 2:2′-dichloro-4:4′-dinitro-azobenzenes; the 2:2′-dinitro-, 2:4:4′-trinitro-, 2:4:2′:4′-tetranitro-, 2:4:6:4′-tetranitro-, 2:4:6:2′:4′-pentanitro-, 2:4:6:2′:4′:6′-hexanitro-, and 2:2′-dichloro-4:4′-dinitro-hydrazobenzenes.

***252. "The existence of quinonoid salts of *o*-nitroamines and their conversion into oxadiazole oxides." By Arthur George Green and Frederick Morris Rowe.**

In the course of the previous investigation it was observed that when *o*-nitroaniline is oxidised with hypochlorites in strongly alkaline solution it is quantitatively converted into the compound hitherto known as "dinitrosobenzene" or "*o*-benzoquinonedioxime peroxide." This reaction, together with several other considerations, has led the authors to believe that the compound and its analogues are more correctly represented as benz*iso*oxadiazole (benzfurazan) oxides, and that the change takes place thus:

$$C_6H_4\!<\!\begin{matrix}NH\\ N\cdot ONa\\ \ddot{O}\end{matrix} \longrightarrow C_6H_4\!<\!\begin{matrix}N\cdot OH\\ N\cdot ONa\\ \ddot{O}\end{matrix} \longrightarrow C_6H_4\!<\!\begin{matrix}N\\ N\\ \ddot{O}\end{matrix}\!>\!O.$$

This formula for the product involves no migration of an oxygen atom, either here or in Zincke and Schwartz's method of formation from *o*-nitrotrisazobenzene. If its correctness is admitted, the reaction affords strong support for the existence of *aci*-quinonoid salts of *o*-nitroamines, and this conclusion is still further strengthened by the observation that *o*-nitroaniline dissolves in alcoholic potassium hydroxide with an orange-red colour, and that the oxidation in neutral solution takes an entirely different and more normal course, giving 2:2′-dinitroazobenzene:

$$C_6H_4\!<\!\begin{matrix}NH_2\\ NO_2\end{matrix} \longrightarrow C_6H_4\!<\!\begin{matrix}NH\cdot OH\\ NO_2\end{matrix} \longrightarrow \left(C_6H_4\!<\!\begin{matrix}N:\\ NO_2\end{matrix}\right)_2$$

The formation of benz*iso*oxadiazole (benzfurazan) oxides by alkaline oxidation of *o*-nitroamines appears to be a general one, and affords a convenient method of preparing these compounds.

***253. "The essential oil of cocoa."**
By James Scott Bainbridge and Samuel Henry Davies.

The authors find that the aromatic principle of the cocoa bean is an essential oil.

Two thousand kilos. of cocoa nibs were subjected to distillation with steam. From the distillate 24 c.c. of a purified oil were isolated, which proved to be a mixture of esters formed during the fermentation of the cocoa bean with the true essential oil. The latter consists chiefly of a *d*-linalool. Octoic acid and other fatty acids probably derived from cocoa-butter were present, and a small proportion of a stable nitrogenous compound, which was not identified.

***254. "Studies in chemical crystallography. Part I. Co-ordination, isomorphism, and valency." By Thomas Vipond Barker.**

Some new cases of isomorphism of unusual types were described, the bearing of which on chemical and crystallographic theory was discussed. The conclusion was drawn that the ordinarily accepted theory of valency structure is incapable of offering any useful information concerning the structure of the compounds in question. Co-ordination structures, on the other hand, bring out pronounced chemical analogies, from which it is inferred that such structures are not only supported by the crystallographic evidence, but also are more general in inorganic compounds than was formerly suspected. The theories of Sollas and of Barlow and Pope were criticised from the point of view of isomorphism, and the conclusion was drawn that Barlow and Pope's theory in its present form is certainly incapable of general application to inorganic compounds. The view is entertained that the true volume unit in crystalline structures is the atomic rather than the valency volume.

***255. "The oxidation of aconitine." By Francis Howard Carr.**

It was shown that a neutral substance, *oxonitin*, $C_{23}H_{29}O_9N$, together with acetaldehyde, results from the oxidation of aconitine with potassium permanganate in acid solution. Oxonitin crystallises in white, prismatic crystals, m. p. 276—277°; it is sparingly soluble in all solvents, neutral in reaction, and does not combine with acids or alkalis, nor does it give a precipitate with the common alkaloidal reagents. Methyl iodide, hydroxylamine, and acetic anhydride fail to act upon it. It contains three methoxyl groups, and since it gives, like aconitine, acetic and benzoic acids

on hydrolysis, it contains also an acetyl and benzoyl group. It may be presumed that the $N{\cdot}CH_3$-group contained in aconitine is unchanged; its constitution may therefore be represented thus:

$$C_{10}H_9O_2NMe(OBz)(OAc)(OMe)_3.$$

Oxonitin yields different products according as the hydrolysis is brought about by alkali or by hydrochloric acid; in the former case a neutral substance, and in the latter an alkaloid, is produced; in both instances acetic and benzoic acids are formed. The investigation is being continued with a view to the elucidation of the constitution of the hydrolytic substances and of the hypothetical base, $C_{10}H_{15}O_2N$.

DISCUSSION.

Mr. BRADY said that he had been working on the compound described for some time, but had not been able to establish the presence of the acetyl group, and inquired how the author had identified it.

256. "Some time-reactions suitable for lecture experiments." By William Gerald Glendinning and Alfred Walter Stewart.

In concentrated solution, potassium iodide, potassium persulphate, and starch react practically instantaneously, producing starch-iodine blue. When sodium thiosulphate is also present, the appearance of the colour takes a longer or shorter time according to the amount of thiosulphate added. When carried out in the way described below, the reaction forms a simple demonstration of induction periods.

The solutions required are *M*/5-potassium iodide, *N*/10-thiosulphate, a saturated solution of potassium persulphate, and some starch solution. A burette is filled with the thiosulphate solution and fixed over a vessel into which are placed 10 c.c. of the iodide solution, 5 c.c. of the persulphate solution, and 5 c.c. of the starch solution. The starch-iodine blue is formed immediately, and is exactly removed by the thiosulphate. If three extra drops of the thiosulphate are added, the blue colour will not return until a lapse of sixty-three seconds; and if six or nine drops be used, the period is correspondingly prolonged. In more dilute solutions, of course, much longer intervals are obtained.

In order to avoid error in timing, due to adding the thiosulphate drop by drop, the following device may be employed. A T-piece is passed through a loosely-bored cork, which is clamped above the vessel used for the reaction in such a way that the T-piece lies horizontally. A second cork with a flat side cut on it is fixed

firmly on the straight end of the T-piece. The requisite number of drops of thiosulphate solution are then dropped on to a microscope cover glass, which rests on the flat cork; and when it is necessary to add this to the solution, the T-piece is turned round in the bore of the cork so that the cover glass drops off the flat side into the reaction vessel. In this way the whole of the thiosulphate can be added at once. An ordinary square cover glass will retain ten drops easily if care is taken.

The quantities given above are sufficient to allow of the successive addition of three, six, and nine drops of thiosulphate solution without exhausting the other reagents to an undue extent.

Two modifications of the above reaction are as follows: A solution of hydrogen peroxide may be substituted for the persulphate solution, the rest of the reagents remaining the same. In this case, if several titrations have to be carried out with the same solution, it is advisable to add some fresh starch each time the solution is rendered colourless, as otherwise a good tint is not obtained. Using 2 c.c. of potassium iodide solution, 10 c.c. of hydrogen peroxide solution (approximately 20 volumes), 8 c.c. of starch solution, and 50 c.c. of water, when three drops of thiosulphate solution are added the colour appears after about half a minute, the reaction being much more rapid than when potassium persulphate is used.

Instead of using hydrogen peroxide itself, a saturated solution of barium peroxide may be employed; but in this case certain modifications are necessary. The method of working is as follows: The barium peroxide solution is placed in the reaction vessel, and to it some phenolphthalein is added. Sufficient hydrochloric acid to decolorise the phenolphthalein is poured in; and then the starch and potassium iodide are added. The starch-iodine blue is decolorised with thiosulphate as before, and a small excess of thiosulphate added. Should the liquid show any signs of becoming alkaline, as can be seen from the phenolphthalein tint reappearing, a few drops of hydrochloric acid are added. It is inadvisable to have a large excess of acid owing to its effect on the thiosulphate solution.

257. "The problem of strong electrolytes. (Preliminary note.)"
By James Kendall.

The dissociation formula $m^2/(1-m)v = k + c\,.\,(1-m)/m$ has been recently shown by the author from experimental results (*Trans.*, 1912, **101**, 1275) to hold for all acids. The above formula may be arrived at theoretically by the assumption of the presence of complex ions of the type $(R_2)^{\cdot\cdot}$ or $(X_2)''$ in the aqueous solution of

an electrolyte RX. This is already known to be the case for mercurous chloride, which ionises as $(Hg_2)^{\cdot\cdot}(Cl')_2$.

The equations for equilibrium, under the assumption of one complex ion, are of the form:

$$RX \rightleftharpoons R^{\cdot} + X' \quad (1)$$
$$2RX \rightleftharpoons (R_2)^{\cdot\cdot} + 2X' \quad (2)$$

Let the undissociated ratio at dilution v be $1-m$; of the total dissociated part m let n, in the case of one ion, be complex.

Then, applying the law of mass action to the balanced equations (1) and (2) above, we obtain:

$$(m/v) \,.\, [(m-n)/v] = k \,.\, (1-m)/v \quad (3)$$
$$(n/2v) \,.\, (m^2/v^2) = (c/2) \,.\, (1-m)^2/v^2 \quad (4),$$

where k and $c/2$ are constants.

From equation (4) we have $n = cv(1-m)^2/m^2$; substituting for n in (3) we finally arrive at the equation:

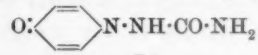
$$m^2/(1-m)v = k + c \,.\, (1-m)/m \quad (5),$$

already found by experiment to hold in the case of all acids.

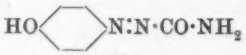
By the assumption that the ions form complexes of the above type in aqueous solution, the above dissociation formula, first obtained experimentally for acids only, may be extended to cover all uni-univalent electrolytes.

258. "Action of semicarbazide hydrochloride on the *p*-quinones. (Preliminary note.)" By Isidor Morris Heilbron and James Alexander Russell Henderson.

Thiele and Barlow (*Annalen*, 1898, **302**, 315) and Borsche (*ibid.*, 1904, **334**, 143) have already examined the action of semicarbazide hydrochloride on *p*-benzoquinone and on some of its derivatives, and found that the compounds formed gave phenols on treatment with sodium hydroxide. They suggest that the condensation products exist in tautomeric forms as semicarbazones (I) and *p*-hydroxyazoformamides (II):



(I.)



(II.)

It seemed, however, to the authors that further evidence was necessary to decide the true constitution of the free condensation products. A spectrographic investigation has been made of the substances obtained by the action of semicarbazide hydrochloride on various *p*-quinones, as well as of the salts and esters of these products. The absorption curves of all the products are very similar, and practically identical in shape and position to those

obtained by Tuck (*Trans.*, 1907, **91**, 449) for the *p*-hydroxyazo-compounds.

The *p*-quinone condensation products with semicarbazide hydrochloride are therefore true hydroxyazo-compounds of the type (II).

The investigation is at present being extended to other similar types of compounds.

259. **"The interaction of azoimide and nitrous acid. (Preliminary note.)"** **By Emil Alphonse Werner.**

Whilst the decomposition of hydrazine by nitrous acid constitutes one of the numerous methods by which azoimide may be obtained, the further action of nitrous acid on azoimide does not appear to have been hitherto examined. When a solution containing sodium azide and sodium nitrite is treated with dilute sulphuric or acetic acid, interaction immediately takes place with brisk evolution of gas, consisting of nitrogen and nitrous oxide. The change takes place in accordance with the equation:

$$N_3H + HNO_2 = N_2 + N_2O + H_2O,$$

and even with very dilute solutions the reaction is completed in a few minutes.

This interaction may be made the basis of a simple and rapid method for the analysis of azides, either by carrying out the decomposition in a nitrometer and measuring the volume of evolved gas, or by titration of a dilute solution of the azide, previously acidulated with dilute sulphuric acid, with a $N/10$-solution of sodium nitrite.

The following results were obtained with a sample of commercial sodium azide (Schuchardt) in a preliminary trial.

I. 0·05 gram of the azide and 0·06 gram of sodium nitrite (95 per cent.) dissolved in 1·5 c.c. of water were introduced into a nitrometer, and 0·5 c.c. of dilute sulphuric acid was added.

Gas evolved = 33·55 c.c. (dry) at 0° and 760 mm.

0·05 Gram of pure sodium azide requires 34·46 c.c.

Hence, 97·35 per cent. of pure sodium azide was present in the sample.

II. A solution was prepared by dissolving 1 gram of the sodium azide in 100 c.c. of water.

Ten c.c. diluted with 70 c.c. of water, and 2 c.c. of dilute sulphuric acid (1 : 7) added, were titrated with a $N/10$-solution of sodium nitrite (1 c.c. = 0·0065 N_3Na) until a drop of the solution after being well stirred gave an immediate blue colour with starch and

potassium iodide solution: 15 c.c. of the sodium nitrite solution were required. Hence, 97·5 per cent. of pure sodium azide was present in the sample.

The latter result is very probably the more accurate, as a small quantity of nitrous oxide is likely to remain in solution in the nitrometer method. It is intended to test the method more fully with some pure azides.

260. "Benzylmethyl-, benzylethyl-, and allyl-ammonium nitrites." By Prafulla Chandra Rây and Rasik Lal Datta.

Benzylmethylammonium nitrite has been obtained in solution only by the double decomposition between silver nitrite and the amine hydrochloride. During the process, minute drops of an oily liquid make their appearance and float on the surface. After the end-point is carefully attained, the solution is left to remain, when within a short time the oil increases considerably, and settles down in globules at the bottom of the vessel. The oil was found to be a nitroso-compound, and analysis proved it to be *benzylmethylnitrosoamine*.

Found: C = 63·54; H = 6·79; N = 18·36.

$C_8H_{10}ON_2$ requires C = 64·00; H = 6·66; N = 18·66 per cent.

The supernatant liquid was examined from time to time, and found to respond to the nitrite reaction. Evidently after the conversion of the greater portion of the nitrite into the nitroso-compound a process of equilibrium sets in, thus:

$$C_7H_7\cdot NHMe,HNO_2 \rightleftharpoons C_7H_7\cdot NMe\cdot NO + H_2O.$$

Benzylethylammonium nitrite has been obtained by the usual method as a pale yellow, crystalline substance.

Found: C = 59·02; H = 7·83; N = 15·45.

$C_9H_{14}O_2N_2$ requires C = 59·34; H = 7·69; N = 15·38 per cent.

The salt sublimes at 50—55° with simultaneous decomposition, although it begins to decompose slowly at the ordinary temperature (24°) in a vacuum. The sublimate consists of white, glistening crystals. The products of decomposition are nitrogen, a nitroso-compound, and alcohols, according to the equations:

$$C_9H_{14}O_2N_2 = C_7H_7\cdot OH + C_2H_5\cdot OH + N_2.$$

$$C_9H_{14}O_2N_2 = C_7H_7\cdot NEt\cdot NO + H_2O.$$

Allylammonium nitrite prepared similarly is a brown, viscid liquid, having the characteristic odour of alkylammonium nitrites.

Found: C = 34·82; H = 8·05; N = 27·15.

$C_3H_8O_2N_2$ requires C = 34·62; H = 7·69; N = 26·92 per cent.

The salt decomposes in a vacuum into nitrogen and allyl alcohol.

261. "Note on the action of ethylene oxide on hydrazine hydrate."
By Edward de Barry Barnett.

When ethylene oxide is added to a large excess of well-cooled hydrazine hydrate, a brisk reaction takes place with evolution of heat. After distilling off the excess of hydrazine, an oily residue remains, from which two substances can be separated by repeated fractionation in a vacuum.

β-Hydroxyethylhydrazine, $HO{\cdot}C_2H_4{\cdot}NH{\cdot}NH_2$, is the main product of the reaction, and forms a colourless, very viscous oil, which boils at 119—120°/9 mm.:

0·2628 gave 0·3034 CO_2 and 0·2560 H_2O. C = 31·5; H = 10·8.
0·1378 „ 44·0 c.c. N_2 at 18° and 756 mm. N = 36·7.
$C_2H_8ON_2$ requires C = 31·6; H = 10·5; N = 36·9 per cent.

It at once combines with formaldehyde with evolution of heat to form a *compound*, $C_4H_8ON_2$, which crystallises from alcohol in colourless needles melting at 224°:

0·2058 gave 0·3610 CO_2 and 0·1556 H_2O. C = 47·8; H = 8·4.
0·1010 „ 23·8 c.c. N_2 at 15° and 762 mm. N = 27·7.
$C_4H_8ON_2$ requires C = 48·0; H = 8·0; N = 28·0 per cent.

Di-β-hydroxyethylhydrazine, $[HO{\cdot}C_2H_4{\cdot}NH{\cdot}]_2$ or $(HO{\cdot}C_2H_4)_2N{\cdot}NH_2$
(Found, C = 39·7; H = 10·1. Calc., C = 40·0; H = 10·0 per cent.), forms a colourless, very viscous syrup, which boils at 171°/10 mm. It is probably identical with the *as*-di-β-hydroxyethylhydrazine described by Knorr and Brownsdon (*Ber.*, 1902, **35**, 4474) as boiling at 188—190°/25 mm.

262. "Note on the hydrolysis of acetic anhydride."
By James Charles Philip.

In connexion with Orton and Jones's paper on this subject (*Trans.*, 1912, **101**, 1708), the results of some preliminary experiments made a few years ago in the author's laboratory were described.

The course of the reaction between acetic anhydride and water in glacial acetic acid solution was followed by determining the freezing point from time to time. As the anhydride and water progressively combine, the freezing point rises steadily until, when one or other of the two substances has disappeared, it reaches a constant value. If the acetic anhydride and water were taken in equivalent proportion, this final constant value would be the freezing point of absolute acetic acid.

In reality, the depressions recorded at successive intervals are not strictly comparable, for as the reaction proceeds the quantity

of solvent increases—by about 3 per cent. from beginning to end in the actual experiments. It would be quite possible to allow for this in evaluating the velocity-coefficient, but, in view of the preliminary character of the work, no correction was applied.

When a mixture of acetic acid, acetic anhydride, and water had been prepared, portions were transferred to tubes of special resistance glass, which were then sealed up and immersed for different periods in a water-bath kept at a constant temperature. Each tube, on being taken out of the bath, was rapidly cooled, and the freezing point of the contents was determined immediately.

The acetic acid used was obtained by repeatedly freezing out the pure commercial acid, and had a freezing point of 16·42° (corr.). It still contained a trace of water, the amount of which was determined by adding a slight excess of acetic anhydride, and heating samples of the mixture in sealed tubes until no further change in freezing point was observed; thus, in one estimation, 0·939 gram of pure anhydride was added to 68·154 grams of the acetic acid with freezing point 16·42°; a sample of this mixture, heated at 100° for fifteen hours, showed a rise of 0·39° in freezing point; another sample, heated for thirty-two hours at 100°, showed a rise of 0·40°. Half the rise was due to the water, the amount of which was therefore 0·1 per cent.

The following table shows the results obtained in one case for the velocity of the reaction at 70·1°. The mixture made up contained 267·02 grams of acetic acid, 6·23 grams of anhydride, and 1·123 grams of water. In calculating the velocity-coefficient by the formula $0{\cdot}4343k=\frac{1}{(a-b)t}\log\frac{b(a-x)}{a(b-x)}$, allowance has been made for the water present in the acetic acid.

t min.	F.-p. depression.	k.
0	1·550°	—
30	1·415	0·0033
60	1·290	0·0035
90	1·170	0·0037
160	0·970	0·0037
250	0·784	0·0038
360	0·653	0·0036
500	0·520	0·0037
600	0·446	0·0037
∞	0·115	—

In the experiment just recorded, water was in excess. Another similar experiment, carried out at the same temperature but with acetic anhydride in excess, gave the following values of k at somewhat similar intervals: 0·0032, 0·0034, 0·0034, 0·0035, 0·0035, 0·0036, 0·0037, 0·0037, 0·0037, 0·0036.

The mean value of k at 70·1° may therefore be taken as approxi-

mately 0·0036. From an experiment made at 80·5° a mean value of 0·0063 was obtained for k.

263. "**Condensation of bromoacyl haloids with glucosamine (Preliminary note.)**" **By Arthur Hopwood and Charles Weizmann.**

Bromoacyl haloids condense with glucosamine in cold alkaline solution, yielding bromoacylglucosamines.

α-Bromopropionylglucosamine,

$$CH_3{\cdot}CHBr{\cdot}CO{\cdot}NH{\cdot}CH(CHO){\cdot}[CH(OH)]_3{\cdot}CH_2{\cdot}OH,$$

is prepared by adding α-bromopropionyl bromide (1 mol.) and *N*-sodium hydroxide (1 mol.) gradually, and alternately with frequent shaking to a cold solution of glucosamine hydrochloride (1 mol.) in *N*-sodium hydroxide (1 mol.). A colourless precipitate separates out, which, after addition of hydrochloric acid in slight excess, is collected, washed with a little cold water, and dried in air on a porous plate. The product crystallises from hot absolute alcohol in prismatic needles, melting and decomposing at 200—201° when gently heated, and at 210—211° when quickly heated. The crystals are readily soluble in water or dilute alcohol, but are only sparingly soluble in absolute alcohol. They dissolve instantly in cold ammonia or alkali hydroxides.

α-Bromoisohexoylglucosamine,

$$CHMe_2{\cdot}CH_2{\cdot}CHBr{\cdot}CO{\cdot}NH{\cdot}CH(CHO){\cdot}[CH(OH)]_3{\cdot}CH_2{\cdot}OH,$$

is prepared by the condensation of α-bromo*iso*hexoyl bromide (1 mol.) and glucosamine hydrochloride (1 mol.) in alkaline solution. It crystallises from absolute alcohol as a mixture of rhombic plates and prismatic needles, which melts when heated quickly at 178—181° with much decomposition. The crystals are moderately soluble in cold, and readily so in hot, water. They are sparingly soluble in cold, but readily so in hot, absolute alcohol. They dissolve slowly in cold ammonia or alkali hydroxides.

α-Bromolaurylglucosamine,

$$C_{11}H_{22}Br{\cdot}CO{\cdot}NH{\cdot}CH(CHO){\cdot}[CH(OH)]_3{\cdot}CH_2{\cdot}OH,$$

is prepared by condensing α-bromolauryl chloride (1 mol.) and glucosamine hydrochloride (1 mol.) in a slightly alkaline solution. It crystallises from absolute alcohol in rhombic plates, which melt and decompose at 183—186°. The crystals are insoluble in hot or cold water, and moderately soluble in hot absolute alcohol. They do not dissolve in dilute hydrochloric acid, which shows that the amino-group, and not the hydroxy-groups in glucosamine, has been attacked during the condensation. The crystals are also almost insoluble in cold ammonia or alkali hydroxides.

The *bromoacylglucosamines* reduce alkaline copper solutions,

yielding red cuprous oxide, or ammonio-silver nitrate solution giving a silver mirror. On treatment with cold ammonium hydroxide and subsequent evaporation to dryness under diminished pressure, they yield colourless, crystalline solids, probably *aminoacylglucosamines*.

264. "Note on the formation of tetrachlorophthalyl chloride by chlorination of tetrachlorophthalide." By William Hobson Mills and Walter Henry Watson.

In view of the paper "On Symmetrical and Asymmetrical Dicarboxylic Acid Chlorides," by E. Ott, which appears in the current number of the *Annalen* (1912, **392**, 245), the authors communicated this note on some experiments on the chlorination of tetrachlorophthalide, undertaken on account of their possible bearing on the constitution of the chlorides of the 1:2-dicarboxylic acids.

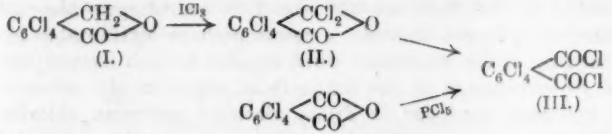
Tetrachlorophthalide, as would be expected, is very resistant to chlorination, but the displacement of the two atoms of hydrogen was effected by heating the phthalide (5 grams) with excess of iodine trichloride (10 grams) in a sealed tube for five hours to 150°. Iodine and iodine chlorides were then removed by warming under diminished pressure, and the product was purified as far as possible by crystallising first from carbon tetrachloride and then repeatedly from light petroleum, when it melted at 132—134°. That it had been formed from the phthalide by the displacement of the two hydrogen atoms by two atoms of chlorine was shown by the fact that on warming with sodium carbonate solution it was hydrolysed with the formation of tetrachlorophthalic acid, as well as by the analysis. (Found: reactive Cl = 20·3; $C_8O_2Cl_4(Cl_2)$ requires reactive Cl = 20·8 per cent.)

This product was identical with that obtained by the action of phosphorus pentachloride on tetrachlorophthalic anhydride, agreeing exactly in melting point,* general characters, and analysis. In particular, the mixed melting point showed no depression, and although a similar difficulty to that experienced by Ott (*loc. cit.*, p. 274) and by Brühl (*Annalen*, 1886, **235**, 13) was met with in obtaining either product quite free from acid anhydride, there was no doubt as to their identity.

In the light of Ott's discoveries, it is clear that the obvious conclusion that tetrachlorophthalyl chloride possesses the asym-

* The melting point 118° given by Graebe (*Annalen*, 1887, **238**, 328) is accordingly too low if the compound is not dimorphic.

metrical structure (II) (hexachlorophthalide) would not be legitimate:



It must rather be assumed that at the temperature at which the chlorination takes place, hexachlorophthalide undergoes transformation, and that the product obtained in both reactions is the symmetrical acid chloride (III).

265. **"Note on the preparation and properties of sulphonic esters."** **By John Ferns and Arthur Lapworth.**

In a recent paper (*Trans.*, 1912, **101**, 273) the authors described experiments showing that the reactions of sulphonic esters almost wholly depend on the nature of the alcohol from which the esters are derived. The behaviour of ethyl and methyl esters towards bases, and also towards sodium β-naphthoxide had been previously described, however (compare Ullmann and Werner, *Annalen*, 1903, **327**, 120, and D.R.-P. 112177), a fact which the authors regret they had overlooked.

The list of available methods for preparing sulphonic esters given in that paper was intended to be complete, but did not include one by Ullmann (*Annalen*, 1903, **327**, 117), who showed that certain aromatic sulphonic acids may be converted into esters by treatment of their sodium salts with methyl sulphate.

In extension of the work described in the former paper, the authors have found that *p*-toluenesulphonyl chloride, dissolved in pyridine, converts many alcohols directly and smoothly into the corresponding unsaturated hydrocarbons, sulphonic esters being doubtless intermediate products; by the same process glycerol may partly be converted into acrolein. It is hoped to extend the observations to other hydroxy-compounds.

266. **"Electromotive forces in alcohol. Part III. Further experiments with the hydrogen electrode in dry and moist alcoholic hydrogen chloride."** **By Robert Taylor Hardman and Arthur Lapworth.**

The electromotive forces of a series of concentration cells reversible to hydrions have been measured at 25°, and the corresponding

values for the transport number of chloridion in absolute alcoholic hydrogen chloride were calculated with the aid of Nernst's equation. These values vary between 0·20 and 0·35, according to the concentration of hydrogen chloride, a result perhaps attributable to the inadequacy of the expression when applied to such electrolytes.

A re-examination of the influence of water on the potential of the hydrogen electrode in dilute alcoholic hydrogen chloride at 25° has been carried out with results similar to those recorded in Part II. (*Trans.*, 1911, **99**, 2250). The temperature-coefficients of the cells were also determined, and shown to be in fairly satisfactory agreement with the requirements of the solvate theory and with previous numerical data obtained from measurements on catalytic activity and availability.

267. "The properties of α-bromonaphthalene."
By John Ickeringill Crabtree and Arthur Lapworth.

The authors have prepared α-bromonaphthalene in a fairly high state of purity. It appears to be dimorphous, the ordinary modification melting at 6·20° and the second between 0·2° and 0·7°, although it is uncertain whether the latter has been obtained quite free from the former.

Several of the more important physical constants of the substance have been redetermined.

268. "Absorption spectra of the cobalto-derivatives of primary aliphatic nitroamines." By Antoine Paul Nicolas Franchimont and Hilmar Johannes Backer.

The cobalto-derivatives of primary aliphatic nitroamines, $Co(NR{\cdot}NO_2)_2$, have, both in aqueous solution and in the anhydrous state, an intensely purple-violet colour, differing from that of solutions of ordinary cobalt salts.

The cobalt derivatives of ethylnitroamine and propylnitroamine combine with two molecules of water, forming respectively yellowish-brown and bronze-green crystals; from methylnitroamine such a compound has not been obtained.

In order to gain objective data, the absorptive power for visible rays of the dissolved cobalt salts of methyl-, ethyl-, and propylnitroamine has been studied and compared with that of a cobalt nitrate solution.

The chief absorption band is found to be almost the same for the three cobaltonitroamines, but different from that shown by cobalt

nitrate. In addition, cobaltomethylnitroamine shows an absorption for smaller wave-lengths.

The conclusion is drawn that in cobaltonitroamines the metal is attached to the nitrogen atom.

269. "The constituents of Cluytia similis." By Frank Tutin and Hubert William Bentley Clewer.

Cluytia similis, Muell. Arg., which is identical with the plant referred to by Smith ("A Contribution to South African Materia Medica," Cape Town, 1895, p. 57) as a smaller variety of *Cluytia hirsuta*, is reputed in South Africa to be of value as an antidote for anthrax and for the disinfection of "milt-ziek," or anthrax-infected meat. The root of this plant is also stated to be eaten by natives as an antidote for snake-bite poisoning. The entire above-ground portions, and also the root, of *C. similis* have therefore been submitted to chemical examination, when, in addition to chrysophanol, fatty acids, and other known compounds, the following new substances were isolated: (i) *Cluytyl alcohol*, $C_{28}H_{58}O$ (m. p. 82·5°); (ii) *cluytinic acid*, $C_{21}H_{42}O_2$ (m. p. 69°); (iii) *cluytyl cluytinate*, $C_{49}H_{98}O_2$ (m. p. 76·5°); (iv) *cluytiasterol*, $C_{27}H_{44}O$ (m. p. 159°); (v) a new *acid*, $C_{10}H_{10}O_4$ (m. p. 159°); (vi) *cluytianol*, $C_{23}H_{37}O(OH)_3$ (m. p. 300—305°). Cluytianol is isomeric with the dihydric alcohol, ipuranol, which it resembles in its general properties. *Triacetylcluytianol* melts at 160°, and the *tribenzoyl* compound at 192°. The root also contained a quantity of inorganic matter, in which strontium was present.

270. "The constitution and reactions of thiocarbamides." By Augustus Edward Dixon and John Taylor.

A consideration of the synthetic methods for producing "thiocarbamide," or its substitution derivatives containing univalent radicles, and of the properties displayed by these substances, leads the authors to conclude that, when in the static condition, they are all constituted on the type $NH_2{\cdot}CS{\cdot}NH_2$.

By reaction with halogen compounds, **RX** (X = haloid), thiocarbamides generally yield products containing the nucleus of iminothiocarbamic acid, $NH_2{\cdot}C(:NH){\cdot}SH$, or "thiourea"; it does not follow, however, that the parent substances have the configuration of the latter, or acquire it through tautomeric change of a thiocarbamide, prior to interaction. In the authors' view, such phenomena are better explained as follows: The primary product is an additive compound of the type $\begin{matrix}NH_2\\NH_2\end{matrix}\!>\!C{:}S\!<\!\begin{matrix}R\\X\end{matrix}$; when from this the

elements of HX are withdrawn, the sulphur again becomes bivalent, the radicle, R, if alkyl, retaining its place, with formation of $NH_2{\cdot}C(:NH){\cdot}SR$, but if acyl, moving to the unsaturated nitrogen atom, to give a substituted thiocarbamide, $RNH{\cdot}CS{\cdot}NH_2$.

When the radicle, R, itself contains halogen or hydroxyl, the secondary product may undergo further change, with loss of halogen acid, or of water; in the former case, if the thiocarbamide contains an acyl radicle, this is eliminated preferentially to hydrogen.

s-Dibenzoyldiphenylthiocarbamide yields with chloroacetyl chloride, diphenyl*iso*thiohydantoin, $PhN{:}C\langle^{NPh\cdot CO}_{S\text{——}CH_2}$, and benzoyl chloride, the explanation, on the above lines, being as follows:

$$\begin{matrix}NPhBz\\NPhBz\end{matrix}\rangle C{:}S\langle\begin{matrix}Cl\\CH_2{\cdot}COCl\end{matrix} \longrightarrow \begin{matrix}NPhBz\\PhN\end{matrix}\rangle C{\cdot}S{\cdot}CH_2{\cdot}COCl \longrightarrow$$

$$PhN{:}C\langle^{NPh\cdot CO}_{S\text{——}CH_2}.$$

271. **"The effect of heat on a mixture of benzaldehydecyanohydrin with *m*-chloroaniline and with *m*-toluidine." By Clement William Bailey and Hamilton McCombie.**

The authors have extended the work described by Everest and McCombie (*Trans.*, 1911, **99**, 1752) by studying the effect of replacing aniline by substituted anilines.

When benzaldehydecyanohydrin and *o*-chloroaniline are heated together, even for several days, no condensation product could be obtained. In the case of *m*-chloroaniline, the products obtained were exactly analogous to those described by Everest and McCombie in the case of aniline itself, namely, (1) m-*chloroanilinophenylacetonitrile*, $C_6H_4Cl{\cdot}NH{\cdot}CHPh{\cdot}CN$; (2) *dibenzoyldi*-m-*chloroanilinostilbene*, $C_6H_4Cl{\cdot}NBz{\cdot}CPh{:}CPh{\cdot}NBz{\cdot}C_6H_4Cl$; (3) 1:5-*diphenyl*-3-m-*chlorophenylglyoxaline*, $C_{27}H_{19}N_2Cl$, and (4) *α-keto-β*-m-*chloroanilino-αβ-diphenylethane*.

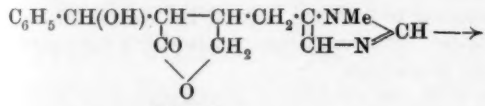
When *p*-chloroaniline was employed, the reaction took a different course. The product which was obtained gave figures in agreement with the formula $C_{35}H_{24}O_3N_2Cl_2$. The constitution to be assigned to this compound has not been determined, but it is hoped to return to this work later.

When the reaction was extended to the toluidines, results similar to those obtained in the case of the chloroanilines were obtained; thus, *o*-toluidine did not react with benzaldehydecyanohydrin, *m*-toluidine yielded products exactly analogous to those obtained

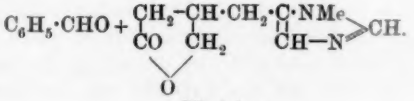
in the case of aniline and *m*-chloroaniline, whilst *p*-toluidine gave a substance of the formula $C_{37}H_{30}O_3N_2$.

272. "Pilosine: a new alkaloid from Pilocarpus microphyllus." By Frank Lee Pyman.

From the mother liquors remaining after the separation of pilocarpine and *iso*pilocarpine from the total alkaloids of *Pilocarpus microphyllus*, a new alkaloid, *pilosine*, has been isolated in a yield amounting to 0·007 per cent. of the leaves. Pilosine has the empirical formula $C_{16}H_{18}O_3N_2$, and is a monacid base. It melts at 187° (corr.), and has $[\alpha]_D$ +39·9°. It contains an *N*-methyl, but no methoxy-group. It also contains a lactonic grouping. On treatment with acetic anhydride it yields a new unsaturated base, *anhydropilosine*, $C_{16}H_{16}O_2N_2$, which melts at 133—134° (corr.), and has $[\alpha]_D$ +66·2°. Pilosine is decomposed on distillation with 20 per cent. aqueous potassium hydroxide, benzaldehyde and a new base, *pilosinine*, $C_9H_{12}O_2N_2$, being formed. The chemical and physiological properties, as well as the solubilities of the latter base, are very similar to those of pilocarpine and *iso*pilocarpine, and it seems probable that this base is a lower homologue of these alkaloids. Its formation from pilosine may then be represented as follows:

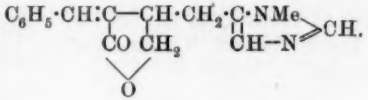


Pilosine.



Pilosinine.

and anhydropilosine would then have the formula:



The physiological action of the three alkaloids is similar to, but very much weaker than that of pilocarpine.

273. "Note on the alkaloids of Pilocarpus racemosus." By Hooper Albert Dickinson Jowett and Frank Lee Pyman.

The statements in the literature with regard to the amount and nature of the alkaloid contained in the leaves of *Pilocarpus racemosus* (Guadeloupe jaborandi) are conflicting.

Holmes (*Pharm. J.*, 1903, [iv], **17**, 713) quoted the statement of G. Rocher, who examined the leaves in 1898–1899, that these contained 1 per cent. of total alkaloids, of which two-thirds was pilocarpine, but mentioned that another sample examined in the laboratories of Messrs. Wright, Layman, and Umney, Ltd., contained only 0·34 per cent. of total alkaloids.

Later, Holmes stated (*ibid.*, 1904, **18**, 54) on the authority of A. J. Cowley, that the leaves of *P. racemosus* contained 0·6 per cent. of total alkaloids, which gave about 50 per cent. of a crystalline nitrate melting at 155°. Since pilocarpine nitrate melts at 178° and *iso*pilocarpine nitrate at 159°, he considered that this nitrate probably consisted largely of *iso*pilocarpine nitrate, or possibly of some other alkaloid.

Some time ago the authors examined a quantity of leaves of *P. racemosus* at the request of the Director of the Royal Gardens at Kew; on extracting the alkaloids and purifying them in the usual way, they obtained pure pilocarpine nitrate melting at 178° (corr.) in a yield amounting to 0·12 per cent. of the leaves, but no other crystalline products. This result confirms Rocher's statement that the leaves contain pilocarpine.

The mother liquors after the removal of pilocarpine gave a red coloration with sodium diazobenzene-*p*-sulphonate, indicating the presence of a base containing a free imino-group, and contained a small amount of bases sparingly soluble in water. The latter did not yield pilosine (compare the preceding abstract) when seeded with this alkaloid, and the quantity was insufficient to admit of further purification.

274. "The ignition of electrolytic gas by the electric discharge." By Hubert Frank Coward, Charles Cooper, and Christopher Henry Warburton.

By suitable modifications in the usual apparatus for passing an electric discharge through a gaseous mixture, it has been found possible to ignite electrolytic gas ($2H_2+O_2$) at pressures much lower than any previously recorded. A flame which filled a globe of 570 c.c. capacity has been produced at 5 mm. pressure, and one which travelled the whole length of a cylinder 2 metres long at

8 mm. In each case a small amount of gas remained uncombined. In two globes this residue varied in amount inversely as the original pressure of the gas, up to 70 mm. pressure.

275. **"The relation between viscosity and chemical constitution. Part V. The viscosity of homologous series." By Albert Ernest Dunstan and Ferdinand Bernard Thole.**

Having had two long homologous series placed at their disposal by Dr. Pickard, the authors have examined the viscosities of the different members therein. They have compared the various physical properties which have been measured for these series, namely, rotatory power, density, refractive power, and viscosity, and find that the strongly constitutive properties of optical rotatory power and viscosity give similar curves when plotted against molecular weight. Linear relationships are afforded by density, boiling point, refractive index, and log η. The rotatory powers and viscosities rise to the third or fourth member, and then proceed normally.

276. **"The relation between viscosity and chemical constitution. Part VI. Viscosity an additive function. By Albert Ernest Dunstan and Ferdinand Bernard Thole.**

Attention was drawn to the linear relationship afforded by log viscosity in any homologous series. Using the data of Gartenmeister and Thorpe and Rodger, it was shown that group constants of log η may be obtained, from which molecular values may be calculated in good agreement with those observed.

Using this method for ethyl acetoacetate, it is found that 6·7 per cent. of the enolic form is present in the equilibrium mixture.

277. **"The relation between viscosity and chemical constitution. Part VII. The effect of the relative position of two unsaturated groups on viscosity." By Albert Ernest Dunstan, Thomas Percy Hilditch, and Ferdinand Bernard Thole.**

The authors have examined the viscosities of a number of homologous series of compounds of the respective types $R{\cdot}[CH_2]_n{\cdot}R$ and $Ph{\cdot}[CH_2]_n{\cdot}R$, where R is a varying unsaturated radicle.

In both series the general order of the molecular viscosity rises when R is varied in the order Cl, CO_2Et, NH_2, and CN, and in addition the initial member, containing two chemically adjacent

unsaturated groups, has been found to possess an exalted molecular viscosity, as calculated from the expression $\frac{\eta \times 10^6}{\text{Mol. Vol.}}$.

In the symmetrical series $R{\cdot}[CH_2]_n{\cdot}R$, the members represented by $R{\cdot}CH_2{\cdot}CH_2{\cdot}R$ possess an enhanced value for this expression, but this is not the case in the phenyl group of compounds.

In the latter group the anomaly of the initial member is in general very pronounced, and is followed by an equally well-marked depression in the case of the second member, the values thereafter rising somewhat rapidly; the relative positions of the curves connecting the molecular viscosities of the members of each homologous series, the relative slopes of these curves, and the extent of the depression at the second term are in the ascending order R = H, Cl, CO_2Et, NH_2, CN, and OH.

The series examined afford undoubted evidence of the strong mutual influence of two unsaturated groups on viscosity, not only when the radicles concerned are adjacent in the molecule, but also when they may be supposed from common steric considerations to approach one another in space.

In addition, indications have been obtained of the varied influences exerted by combinations of two similar, and on the other hand of two dissimilar, radicles, the effects in the latter case depending to all appearance on the relative degree of unsaturation of the component radicles.

278. "Contributions to the chemistry of the terpenes. Part XIV. The oxidation of pinene with hydrogen peroxide." By George Gerald Henderson and Maggie Millen Jeffs Sutherland.

When pinene is oxidised with 30 per cent. aqueous hydrogen peroxide in presence of acetic acid, the chief product is α-terpineol, $C_{10}H_{17}{\cdot}OH$, partly free and partly as the acetate. The other neutral products of the reaction include borneol (as the acetate), a small quantity of dipentene, a trace of the aldehyde, $C_{10}H_{16}O$, formerly obtained by the oxidation of pinene with chromyl chloride, and some menthane-1 : 4 : 8-triol (1 : 4 : 8-trioxyterpan), $C_{10}H_{17}(OH)_3$. The last compound has been obtained by oxidising $\Delta^{4(8)}$-menthenol-1 with dilute permanganate, but has not hitherto been directly produced from pinene. Neither pinene glycol, pinol, nor any ketone was detected among the oxidation products, and only a trace of an oily acid, or mixture of acids, was obtained.

It is obvious that the behaviour of pinene towards hydrogen peroxide differs very considerably from that of camphene under similar conditions (Henderson and Sutherland, *Trans.*, 1911, **99**,

1539), and that in this case, as in many others, the action of the reagent leads to disruption of the dimethyl*cyclo*butane ring in pinene, and to the formation of derivatives of isomeric terpenes.

279. "Baly and Krulla's hypothesis of fluorescence."

By Alexander Killen Macbeth.

To be of ordinary utility and find general acceptance, a theory of fluorescence must necessarily differentiate between absorbing substances which fluoresce and those which do not. It must also lay stress on the variation in wave-length and the increase in duration of the emission when the substance is in the solid state. The recent hypothesis of fluorescence put forward by Baly and Krulla (*Trans.*, 1912, **101**, 1469) offers no explanation of these points.

The basis on which their hypothesis is built is the assumption of different degrees of binding up of the secondary valencies of the constituent atoms of the molecule; thus a substance is capable of existing, first, in a state 1, in which maximum condensation of the force field has occurred; after that in states 2, 3, 4, . . . etc., representing various stages of "opening up." The change $1 \longrightarrow 2$ is brought about by the selective absorption of light of wave-length λ_2. By the influence of light of, say, wave-length λ_3 and a suitable solvent, the substance may be opened up into 3. Hence the reverse reaction $3 \longrightarrow 2$ must be accompanied by an emission of light of wave-length λ_3. If the substances 1, 2, 3, . . . are present, the change $2 \longrightarrow 1$ must involve disturbance of the system $3 \longrightarrow 2$; that is, in the bringing about again of the state 1, which has been disturbed by the absorption of light λ_2, we must get the process $3 \longrightarrow 2$, or emission of λ_3 also. Baly and Krulla further state that because of this, when 1 passes into 2 by the absorption of light of wave-length λ_2, the change $3 \longrightarrow 2$ is produced with the emission of light of wave-length λ_3, the latter constituting the fluorescence. It does not seem reasonable to suppose such to be the case. If the substance can exist in the forms 1, 2, 3, . . ., it is justifiable, in the light of chemical theory, to assume that these forms are in the state of chemical equilibrium; thus, 1, 2, 3, . . . being intimately connected, the system can be represented as follows:

$$1 \rightleftharpoons 2 \rightleftharpoons 3.$$

On Baly and Krulla's assumptions, the change $1 \longrightarrow 2$ is accompanied by the absorption of light of wave-length λ_2; and the reverse change, $2 \longrightarrow 1$, by an emission of the same light. Similarly, the changes $2 \longrightarrow 3$ and $3 \longrightarrow 2$ are accompanied respectively by absorption and emission of light of wave-length λ_3. It is thus evident

that in equilibrium in solution there is a complete balance of light, as is seen on separating the two systems:

$$\left.\begin{array}{l} 1 \xrightarrow{\text{Absorption of } \lambda_2.} 2 \\ 1 \xleftarrow[\text{Emission of } \lambda_2.]{} 2 \end{array}\right\} \text{Balance} \qquad \left.\begin{array}{l} 2 \xrightarrow{\text{Absorption of } \lambda_3} 3 \\ 2 \xleftarrow[\text{Emission of } \lambda_3.]{} 3 \end{array}\right\} \text{Balance}$$

If, now, the whole system is supposed to be disturbed by an exciting light of wave-length λ_2, effecting the change $1 \longrightarrow 2$, according to the hypothesis, the equilibrium position will then be disturbed, and some of the process $2 \longrightarrow 3$ will result. Later, equilibrium may be supposed to be again attained. The changes in this case are, first, an absorption of λ_2, and secondly, an absorption of λ_3; and if equilibrium is then attained, there is a balance of light with, in addition, the preceding absorption effect. That is, the hypothesis leads to a further absorption of light, without any emission; thus, when the exciting light, λ_2, is cast on the substance, the changes may be represented as shown below:

$$\left.\begin{array}{ll} (\alpha) & 1 \xrightarrow{\text{Absorption of } \lambda_2} 2 \\ (\beta) & 2 \xrightarrow[\text{Absorption of } \lambda_3.]{} 3 \end{array}\right. \qquad (\gamma)\ 1 \rightleftharpoons 2 \rightleftharpoons 3 \Big\} \text{Balance}$$

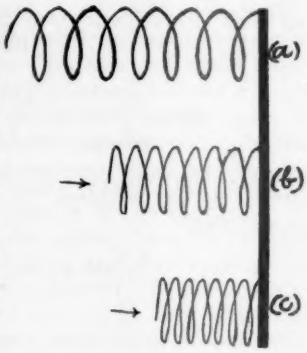
and the effect outstanding is clearly an absorption of λ_2 plus λ_3.

Further, if the exciting light λ_2 is withdrawn, it is most reasonable to suppose that under suitable conditions the reverse reaction will commence, and there will be an emission of the original wave-lengths which were absorbed, in agreement with Kirchhoff's law. This change may be represented thus: First, the system 3, 2 is involved, giving the process $3 \longrightarrow 2$, with its attendant emission of λ_3. This necessarily involves the process $2 \longrightarrow 1$, giving emission of λ_2, and, later, equilibrium is established between 1, 2, and 3. . . . The effect may be summarised thus:

$$\begin{array}{lll} 3 \longrightarrow 2 & & \text{Emission of } \lambda_3 \\ 2 \longrightarrow 1 & & \text{Emission of } \lambda_2 \\ 1 \rightleftharpoons 2 \rightleftharpoons 3 & & \text{Balance} \end{array}$$

Thus the application of the hypothesis would not explain fluorescence; and it seems more capable of explaining phosphorescence, since, whilst the light was acting, the reaction would be driven in the direction $1 \longrightarrow 2 \longrightarrow 3$, the reverse change taking place under suitable conditions when the source of free energy is withdrawn. The system, in closing, would emit free energy in the form of light, and from the above considerations this light would be of a similar nature to that absorbed when the exciting source was in action. Examples in support of this are found in the cases of luminous paints and other phosphorescing substances. Moreover, it would appear from the behaviour of ammonium platinocyanide

that the later stages may be isolated, as on cooling a crystal of this substance to the temperature of liquid hydrogen and exposing it to a strong light, no phosphorescence is noticed on removal to a dark room. On withdrawing the crystal from the chilled tube and allowing it to become warm, it presently emits light of great intensity. Fluorescence in this case is not shown until additional free energy enters the system in the form of heat, disturbing the molecular compound 3, 4, . . . n, and resulting in the re-formation of 1. A real difficulty, however, is met when one considers the case of substances which show no fluorescence at the ordinary temperature, and yet give strong emissions at low temperatures. At $-180°$, acetophenone, benzophenone, asparagine, hippuric, salicylic, and uric acids give brilliant fluorescence which they do not exhibit at the ordinary temperature. Here there are substances, at the ordinary temperature, containing free energy, and showing no fluorescence, which at low temperatures, when much of the free energy has been withdrawn, fluoresce strongly. This cannot be brought into agreement with the hypothesis of Baly and Krulla.



An analogy may be drawn between the hypothetical states 1, 2, 3 . . . n, and a spring fixed at one end. The first state 1 is denoted at (a), this being the state under ordinary conditions. When free energy is supplied to the spring (as light λ_2 is applied to the substance 1), there is absorption, and the spring is compressed to position (b), corresponding with the state 2. Further free energy will compress it to (c), corresponding with λ_3, giving $2 \longrightarrow 3$. Now the Baly-Krulla hypothesis states that $1 \longrightarrow 2$, with absorption of λ_2, involves the change $3 \longrightarrow 2$ with the emission of λ_3; yet there is no apparent reason why compression from (a) to (b) should necessitate the change from (c) to (b), the more so since the state (c) has not been reached. Similarly, on the basis of the hypothesis, if 2 is produced solely by the absorption of λ_2, then 3 cannot exist until 2 is passed, that is, until further absorption has taken place.

On these grounds it cannot be affirmed that an absorption of λ_2 develops an emission of λ_3. An idea of phosphorescence in such cases can, however, be formed by this means. At any degree of compression of the spring, withdrawal of the free energy supply

(that is, pressure) is followed by an emission of the energy stored by the spring; and in the analogous case of light, this represents phosphorescence; but it cannot be taken as giving an account of the cases of acetophenone, etc., mentioned above.

Again, Nichols and Merritt (*Phys. Rev.*, 1904, June and July) have verified that the wave-length of the exciting light may vary over a very wide range, and still produce the same fluorescence spectrum. Applying this to the changes 1, 2, 3, etc., if the wave-length connecting the substances 1 and 2 can vary over a wide range, it seems most reasonable to deduce that the wave-lengths connecting 2 with 3 may also vary considerably. In other words, the fluorescence spectrum would vary widely, on the Baly-Krulla hypothesis, since this postulates that the latter wave-lengths constitute the fluorescence.

Moreover, Nichols and Merritt (*loc. cit.*) have shown, after careful investigation of the intensities of the fluorescence spectra of many substances, that even when the exciting source, λ_2, is made up of a band of spectra, slightly towards the red side of the point of most intense fluorescence, the emitted light is still of good intensity. In this case the exciting source (λ_2) has been varied, not only up to λ_3, but beyond this wave-length. The particular case $\lambda_2 = \lambda_3$ may be taken. On the Baly-Krulla hypothesis, this may be written:

$$1 \xrightarrow{\text{Absorption of } \lambda_2.} 2 \underset{\text{Emission of } \lambda_2.}{\overset{\text{Absorption of } \lambda_2.}{\rightleftharpoons}} 3$$

and it is hard to see what, in such a case, causes an emission of λ_3.

The hypothesis can be regarded from yet another point of view. If it is true that an absorption of λ_2 takes place in the process $1 \longrightarrow 2$, and a simultaneous emission of λ_3 in the process $3 \longrightarrow 2$, the conclusion is inevitable that the amount of light absorbed differs when a substance is fluorescing and when it is in darkness. This is contrary to the facts observed and recorded by Wood (*Phil. Mag.*, 1908, [vi], **16**, 940), who established the identical nature of the absorptions in these cases.

Seeing that the consideration of this hypothesis leads to no clear conception of the special cases of absorbing substances which show fluorescence, offers no explanation of the change of wave-length and duration of the emission when the substance is in the solid state, does not meet the case of substances exhibiting fluorescence as solids and yet showing no traces of the phenomenon when dissolved (for example, barium platinocyanide), and does not increase our knowledge of even the simplest facts in connexion with the phenomenon, it cannot be regarded as a rational theory of fluorescence.

280. "Hydrazoximes of benzil and diacetyl." By Martin Onslow Forster and Biman Bihari Dey.

Unsubstituted hydrazoximes do not appear to have been studied; accordingly, *benzilhydrazoxime*, $C_{14}H_{13}ON_3$, and *diacetylhydrazoxime*, $C_4H_9ON_3$, were prepared, together with their acyl derivatives and products of condensation with benzaldehyde and acetone.

281. "The relation between constitution and rotatory power amongst derivatives of tetrahydroquinaldine." By William Jackson Pope and Thomas Field Winmill.

The authors have prepared a number of derivatives of *l*-tetrahydroquinaldine, and have shown that a close relation is observable between the molecular composition and constitution and the rotation constants of these substances.

282. "The dehydration of *iso*-β-naphthol sulphide." By Kenneth Ross and Samuel Smiles.

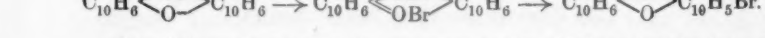
When heated with certain dehydrating agents the unstable sulphide of β-naphthol loses the elements of water, giving an *iso*naphthathioxin (m. p. 148°). It has already been shown that the stable or normal sulphide also yields a naphthathioxin (m. p. 166°) with these reagents. With nitric acid (D 1·4) the *iso*-derivative furnishes the oily nitrate of the sulphoxide, from which the solid base may be liberated by hydrolysis. This sulphoxide is attacked by warm hydrochloric acid, giving a mixture of chloro-derivatives of the naphthathioxin. If the reaction is carried out under suitable conditions, the chief constituent of the crude product is identical with the dichloro-derivative previously obtained (Christopher and Smiles, *Trans.*, 1912, **101**, 710) by chlorinating the monochloronaphthathioxin which is formed by the interaction of acetyl chloride and β-naphthasulphonium-quinone.

The naphthathioxin derived from the stable sulphide of β-naphthol undergoes a precisely similar series of changes; but the sulphoxide and chloro-derivatives are quite distinct from those of the *iso*-series.

The relations between these series are being examined, and will be discussed in connexion with the nature of the two sulphides of β-naphthol.

283. "Salts of naphthathioxonium." (Preliminary note.) By Thomas Joseph Nolan and Samuel Smiles.

Previous attempts to obtain the thioxonium chloride by interaction of hydrogen chloride and oxides of naphthathioxins have uniformly resulted (*Trans.*, 1912, **101**, 710) in the immediate production of chloro-derivatives of the nucleus, the thioxonium salt being apparently too unstable in presence of excess of this mineral acid to permit isolation. It has, however, been observed (*Trans.*, 1910, **97**, 1112) that phenazothionium bromide reacts very sluggishly with hydrogen bromide, whereas the corresponding chloro-derivatives are very reactive. Taking advantage of this observation, it has been found that the thioxonium bromides may be obtained from the naphthathioxin oxides by treatment with luke-warm hydrobromic acid. They are slowly converted by the boiling reagent into the bromonaphthathioxins; the successive changes may be represented as follows:



These thioxonium bromides are more easily obtained by the interaction of bromine and β-naphthasulphonium-quinone in acetic anhydride or with the acetyl derivative of the unstable sulphide of β-naphthol in the same solvent.

284. "Intramolecular rearrangements of *o*-sulphoxides of diphenylamine. Part IV." By Thomas Percy Hilditch and Samuel Smiles.

Previous experiments (*Trans.*, 1911, **99**, 145) have shown that the *o*-sulphoxide of diphenylmethane when treated with hydrogen chloride or hot glacial acetic acid yields thioxanthenyl chloride or thioxanthenol. Attempts have now been made to isolate similar derivatives from the products of rearrangement of the *o*-sulphoxides of diphenylamine; but they were not successful. It was shown, for example, that diphenylamine *o*-sulphoxide yields hydroxythiodiphenylamine when heated with acetic acid, whilst the tetrachloro-derivative furnished the phenazothionium hydroxide. Similar attempts to obtain the *N*-chloro-derivative from the tetranitro- and tetrachloro-sulphoxides were unsuccessful.

285. "**Diphenyl-2 : 3 : 2′ : 3′-tetracarboxylic acid.**" (Preliminary note.) **By James Kenner.**

Dimethyl 3-*iodophthalate*, $C_6H_3I(CO_2Me)_2$, forms prisms, m. p. 89°, and is converted by treatment with copper powder into *tetramethyl diphenyl*-2 : 3 : 2′ : 3′-*tetracarboxylate*, $C_{12}H_6(CO_2Me)_4$, which forms needles melting at 161°.

Diphenyl-2 : 3 : 2′ : 3′-*tetracarboxylic acid*, $C_{12}H_6(CO_2H)_4$, crystallises in plates melting at 265°, and is readily soluble in water.

The reactions of this compound are being investigated in connexion with the author's studies on ring-formation from derivatives of 2 : 2′-ditolyl.

286. "**The reactions of dibenzo*cyclo*heptadienone.**" (Preliminary note.) **By James Kenner and Emily Gertrude Turner.**

In connexion with the authors' investigations of derivatives of 2 : 2′-ditolyl (*Trans.*, 1911, **99**, 2101), a comparison of the reactions of dibenzo*cyclo*heptadienone with those of β-hydrindone has been undertaken.

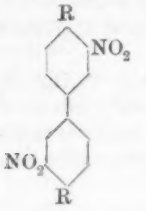
Unlike β-hydrindone, dibenzo*cyclo*heptadienone does not undergo condensation in the presence of alkali, and it yields a *dibenzylidene* derivative, m. p. 227°. Further, whilst β-hydrindone is known to yield a di*iso*nitroso-derivative (from which, by the action of formaldehyde and hydrochloric acid, the authors have prepared triketohydrindene hydrate), dibenzo*cyclo*heptadienone only gives rise to a *mono*iso*nitroso*-derivative, m. p. 197°. With aniline, β-hydrindone yields the normal condensation product (leaflets, m. p. 97°), but the action of aniline on dibenzo*cyclo*heptadienone leads to the formation of phenylcarbylamine and a *compound*, golden-yellow prisms, m. p. 188°, the constitution of which has not yet been ascertained.

Other reactions of the two ketones are under investigation.

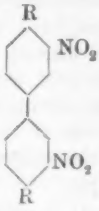
287. "**Studies in the diphenyl series. Part II. The dinitrobenzidines: a new form of isomerism.**" **By John Cannell Cain, Albert Coulthard, and Frances Mary Gore Micklethwait.**

It has hitherto been assumed that the same *o*-dinitrobenzidine is obtained by the nitration of diacetyl- and diphthalyl-benzidine. It is now found that two different *o*-dinitrobenzidines are produced in these reactions. That from diacetylbenzidine melts at 275°, gives a diacetyl derivative melting at 310°, and a dinitrodiphenyl melting at 197—198° (Brunner and Witt, *Ber.*, 1887, **20**, 1023), whilst that from diphthalylbenzidine melts at 233°, gives a diacetyl derivative

melting at 222°, and a *dinitrodiphenyl* melting at 110°. It was suggested that the series of compounds of higher melting points have the symmetrical (I) and those of lower melting points the unsymmetrical (II) constitution (R = H, NH_2, or NHAc):



(I.)



(II.)

Bandrowski's "*iso*dinitrobenzidine" (*Ber.*, 1884, **17**, 1181; *Monatsh.*, 1887, **8**, 472) has been found to be a mixture of 2:2′-dinitrobenzidine and 3:3′-dinitrobenzidine (m. p. 233°) with a small amount of 3-nitrobenzidine.

288. "The velocity of reaction between potassium chloroacetate and some aliphatic amines." By Tom Sidney Moore, Donald Bradley Somervell, and John Newton Derry.

The rates of reaction of potassium chloroacetate with ammonia, the three methylamines, the three ethylamines, and dipropylamine in aqueous solution at 25° have been measured, and the velocity constants calculated from the measurements have been compared with those found by Menschutkin for the reactions of the same bases with methyl, ethyl, propyl, and allyl bromides.

289. "The absence of optical activity in the α- and β-2:5-dimethylpiperazines." By William Jackson Pope and John Read.

The authors have been unable to effect the resolution of either α- or β-2:5-dimethylpiperazine into optically active components by crystallisation with optically active acids or by condensation with *d*-oxymethylenecamphor.

ADDITIONS TO THE LIBRARY.

I. *Donations.*

Accum, *Fredrick.* A treatise on adulterations of food, and culinary poisons, exhibiting the fraudulent sophistications . . . and methods of detecting them. London 1820. pp. xvi + 372. (*Reference.*)
From Dr. Alexander Scott, F.R.S.

Armstrong, *Edward Frankland.* The simple carbohydrates and the glucosides. 2nd edition. London 1912. pp. viii + 171. 5*s.* net. (*Recd.* 25/9/12.)
From the Publishers: Messrs. Longmans, Green and Co.

Arrhenius, *Svante.* Theories of solutions. New Haven 1912. pp. xx + 247. 12*s.* 6*d.* net. (*Recd.* 19/9/12.)
From the Publishers: Oxford University Press.

Bolton, *Edward Richards,* and **Revis,** *Cecil.* Fatty foods, their practical examination. A handbook for the use of analytical and technical chemists. London [1912]. pp. x + 371. ill. 10*s.* 6*d.* net. (*Recd.* 4/11/12). From the Publishers: Messrs. J. & A. Churchill.

Cathcart, *E. P.* The physiology of protein metabolism. London 1912. pp. viii + 142. 4*s.* 6*d.* net. (*Recd.* 14/10/12.)
From the Publishers: Messrs. Longmans, Green and Co.

Chapman, *Alfred Chaston.* Brewing. Cambridge 1912. pp. xii + 130. ill. 1*s.* net. (*Recd.* 11/10/12.) From the Author.

Dakin, *Henry Drysdale.* Oxidations and reductions in the animal body. London 1912. pp. viii + 135. 4*s.* net. (*Recd.* 27/10/12.)
From the Publishers: Messrs. Longmans, Green and Co.

Harris, *Frank.* Gravitation. London 1912. pp. xi + 107. ill. 2/6 net. (*Recd.* 17/9/12.)
From the Publishers: Messrs. Longmans, Green and Co.

Martin, *Geoffrey.* Triumphs and wonders of modern chemistry. London [1912]. 7/6 net. pp. xvii + 358. ill. (*Recd.* 26/8/19.)
From the Author.

Martindale, *William Harrison,* and **Westcott,** *W. Wynn.* The Extra Pharmacopœia. 15th edition. London 1 12. 2 vols. pp. xxxi + 1114, viii + 370. 21/- net. (*Recd.* 31/7/12.) From the Authors.

Michelson, *A. A.* Light waves and their uses. Chicago [1903]. pp. vi + 166. ill. (*Recd.* 25/7/12.) From the University of Chicago.

Pepper, *John Henry.* The Boy's Playbook of Science. Rewritten by *John* **Mastin.** London [1912]. pp. ix + 680. ill. 5*s.* (*Recd.* 2/10/12.) From Dr. John Mastin.

RESEARCH FUND.

A meeting of the Research Fund Committee will be held in December next. Applications for grants, to be made on forms which can be obtained from the Assistant Secretary, must be received on, or before, Monday, December 2nd, 1912.

All persons who received grants in December, 1911, or in December of any previous year, whose accounts have not been declared closed by the Council, are reminded that reports must be in the hands of the Hon. Secretaries not later than Monday, December 2nd.

The Council wish to draw attention to the fact that the income arising from the donation of the Worshipful Company of Goldsmiths is to be more or less especially devoted to the encouragement of research in inorganic and metallurgical chemistry. Furthermore, that the income due to the sum accruing from the Perkin Memorial Fund is to be applied to investigations relating to problems connected with the coal-tar and allied industries.

At the next Ordinary Scientific Meeting on **Thursday, November 21st, 1912, at 8.30** p.m., the following papers will be communicated:

"The change in the boiling points of the trioxide and tetroxide of nitrogen on drying." By H. B. Baker and M. Baker.

"The tendency of atomic weights to approximate to integral and semi-integral values." By E. Feilmann.

"The constituents of Taraxacum root." By F. B. Power and H. Browning, jun.

"The condensation of α-keto-β-anilino-$\alpha\beta$-diphenylethane and its homologues with phenylcarbimide and with phenylthiocarbimide." By S. A. Brazier and H. McCombie.

"Neutral salt action. Part II. The influence of sodium salts of organic acids on the rate of hydrolysis by alkali." By G. Senter and F. Bulle.

"The constitution of aconitine." (Preliminary note.) By O. L. Brady.

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[*Issued* 29/11/12

PROCEEDINGS

OF THE

CHEMICAL SOCIETY.

Vol. 28. No. 406

Thursday, November 21st, 1912, at 8.30 p.m., Professor PERCY F. FRANKLAND, LL.D., F.R.S., President, in the Chair.

The PRESIDENT referred to the loss sustained by the Society, through death on November 9th, of Professor John William Mallet, LL.D., F.R.S., of the University of Virginia, who was elected a Fellow on December 15th, 1857, and an Honorary and Foreign Member on March 2nd, 1911.

Certificates were read for the first time in favour of Messrs.:

Neil Kensington Adam, 21, Barton Road, Cambridge.
Crellyn Colgrave Bissett, B.Sc., B.Met., 10, Claremont Place, Sheffield.
Daniel James Davies, B.Sc., 177, Le Marchant Road, St. John's, Newfoundland.
James Henry Edmondson, Newcroft, Urmston, Manchester.
Ulick Richardson Evans, The Kier, The Common, Wimbledon.
Alfred Leslie Howells, Bank Field, New Mill Road, Holmfirth.
Peter Thomas Leitch, c/o John Edgar, Esq., 176, West George Street, Glasgow.
Thomas Joseph Nolan, M.Sc., 32, Newmarket, Dublin.
Cornelius Theodore Pollard, B.Sc., 21, Wharncliffe Road, Broomhall Park, Sheffield.
Siddons Siddons Wilson, 154, Burges Road, East Ham, E.
Bertrand Turner, B.Sc., 55, Golden Hillock Road, Birmingham.

Certificates have been authorised by the Council for presentation to ballot under Bye-law I (3) in favour of Messrs.:

James Crawford Douglas, Christmas Island, Straits Settlements.

Frederick Lyle Grützmacher, Technical College, Rockhampton, Queensland.

Max Hilbert, Hamburg, Germany.

Tanjore S. Natrajan, Bikshandarkoil P.O., Srirangam, Trichinopoly.

Carl Alfred Nowak, B.Sc., 2739, Mildred Avenue, Chicago, Ill., U.S.A.

Of the following papers, those marked * were read:

***290. "The change in the boiling points of the trioxide and tetroxide of nitrogen on drying." By Herbert Brereton Baker and Muriel Baker.**

As a result of a private communication from Prof. A. Smith as to the volatility of dried calomel, the authors found, on consulting their notebook containing the description of the experiments on the vapour density of dried nitrogen trioxide (*Trans.*, 1907, **91**, 1862), two instances in which the liquid had failed to boil rapidly at 15°. A specimen of the liquid had fortunately been kept, which had been allowed to remain over phosphoric oxide for three years. This was sealed off in bulbs by immersing the whole in liquid air, and two of these were placed in tubes containing nitrogen, dried by contact with phosphoric oxide. After six months' keeping the bulbs were broken, and the boiling point of the liquid at atmospheric pressure (757 mm.) was found to be 43°, instead of −2°, which is the boiling point of the ordinary liquid. On cooling the tube to +10°, green drops formed at once, showing that undissociated nitrogen trioxide was present. When a small quantity of nitrogen, dried by passing through a long column of phosphoric oxide, was admitted to the apparatus, the very small quantity of moisture which it contained produced vigorous dissociation, and the expansion blew out the stopper. It has also been found that dried nitrogen tetroxide could be kept at a temperature of +69° without boiling. The ordinary boiling point of this liquid is +22°. Further experiments on the boiling points of dissociable substances are in progress.

***291. "The tendency of atomic weights to approximate to integral and semi-integral values." By Ernest Feilmann.**

The fact that the atomic weights of the elements so often approximate to integral values, when measured in terms of the usual units, must strike any observer, and has indeed given rise to many speculations on the nature of the elements themselves.

The present communication deals with the relations between the deviations of the atomic weights from integral values, on the one hand, and the number of elements exhibiting such deviations on the other.

The atomic weights of the international table for 1913 were rounded off to the nearest tenth of a unit, and then sorted into ten groups according to the magnitude of the decimal portion of the figures so obtained. Where the figure in the table was exactly midway between two values, that is, where the second decimal place had the value 5, the corresponding element was considered to be shared by the two adjacent groups, each of which was credited with half a unit.

The groups were:

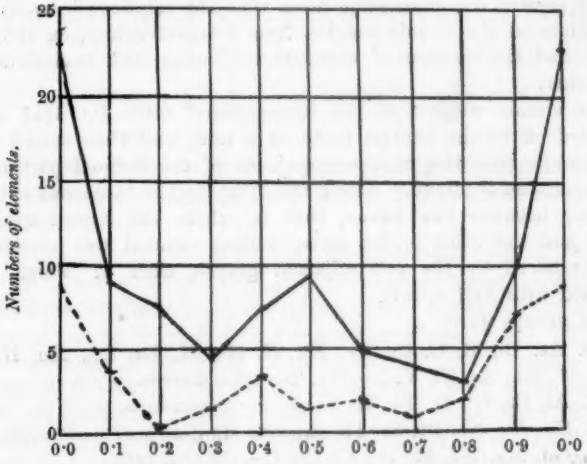
0·0. As, Bi, B, C, Cr, Co, Eu, F, He, H, La, Lu, Mo, N, O, P, Na, Sn, Tl, V. Yb, Yt, W—23 elements.
0·1. Al, Ca, Gl, Ir, Pb, K, Sc, S, Ti—9 elements.
0·2. Sb, Au, Ne, Pt, Se, Tb, Xe, and Ce (half)—7·5 elements.
0·3. Gd, Mg, Nd, Si, and Ce (half)—4·5 elements.
0·4. Ba, Cd, Nt, Ra, Sa, Th, Zn, and Rb (half)—7·5 elements.
0·5. Cl, Cb, Dy, Ge, Ho, Ta, Te, Tn, U, and Rb (half)—9·5 elements.
0·6. Cu, Hg, Pr, Sr, Zr—5 elements.
0·7. Er, Ni, Pd, Ru—4 elements.
0·8. Cs, In, Fe—3 elements.
0·9. A, Br, Ga, I, Kr, Li, Mn, Os, Rh, Ag—10 elements.

Thus we have the following table:

Value of decimal	0·0	0·1	0·2	0·3	0·4	0·5	0·6	0·7	0·8	0·9
Number of elements..	23	9	7·5	4·5	7·5	9·5	5	4	3	10

From this table the upper curve (continuous line) in the figure is plotted. The symmetry of this curve is remarkable, considering how many gaps still remain in the periodic table of the elements and other irregularities, such as errors in the atomic-weight determinations of the less known elements. The other obvious characters of the curve are, first, the very marked rise as integral values are approached, and secondly, the smaller maximum in the neighbourhood of 0·5.

Although all the figures given in the atomic-weight table might be supposed to be significant, it was thought advisable to plot a further curve, using those atomic weights only which are given in the table to two or more significant decimals, as it is possible that the large number of atomic weights in the 0·0 column may be really due, to some extent, to the fact that, for the less known elements these are known only to within about one unit, and that



the 0·0 in these cases is really meaningless. We thus obtain the groups:

0·0. As, C, Co, He, H, N, O, P, Na—9 elements.
0·1. Ca, Pb, K, S—4 elements.
0·2. Ce (half)—0·5 elements.
0·3. Mg, Ce (half)—1·5 elements.
0·4. Ba, Cd, Zn, Rb (half)—3·5 elements.
0·5. Cl, Rb (half)—1·5 elements.
0·6. Cu, Sr—2 elements.
0·7. Ni—1 element.
0·8. Cs, Fe—2 elements.
0·9. A, Br, I, Li, Mn, Ag, Kr—7 elements.

From these figures the lower (dotted) curve is obtained.

Considering that the atomic weights of thirty-two elements only are known with sufficient accuracy to be used for this second curve, its general form agrees very well with that of the first curve; there

is the same well-marked rise as integral values are approached, and the intermediate maximum is also well marked, although it coincides with the value 0·4 instead of with 0·5. This fact may, however, well be due to the comparative lack of data.

It appears from the above considerations that there is a marked tendency for atomic weights to approximate to values which are multiples of unity, or, to a less degree, of 0·5, when the present unit, that is one-sixteenth of the atom of oxygen, is used; when the older standard, namely, the atom of hydrogen, is used as unit these relations no longer hold good.

***292. "The constituents of taraxacum root."**
By Frederick Belding Power and Henry Browning, jun.

The material employed for this investigation consisted of the air-dried fresh roots of taraxacum (*Taraxacum officinale*, Wiggers), collected in the autumn from plants grown in England.

The root was found to contain an enzyme which slowly hydrolysed amygdalin, and an alcoholic extract of the root, when distilled with steam, yielded a small amount of a yellow essential oil.

From the portion of the alcoholic extract which was soluble in water the following compounds were isolated: (i) *p*-hydroxyphenylacetic acid, $C_8H_8O_3$; (ii) 3:4-dihydroxycinnamic acid, $C_9H_8O_4$; and (iii) choline, $C_5H_{15}O_2N$. The aqueous liquid also contained a quantity of sugar, which apparently consisted chiefly of lævulose.

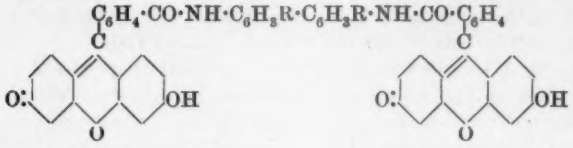
The portion of the alcoholic extract which was insoluble in water consisted of a soft, oily resin, amounting to 1·8 per cent. of the weight of the root. From this material the following compounds were obtained: (i) Two new monohydric alcohols, *taraxasterol*, $C_{29}H_{47}\cdot OH$, and *homotaraxasterol*, $C_{25}H_{39}\cdot OH$, from which several derivatives were prepared; (ii) cluytianol, $C_{29}H_{46}O(OH)_4$; and (iii) palmitic, cerotic, and melissic acids, together with a mixture of unsaturated acids consisting chiefly of oleic and linolic acids.

The so-called "taraxacin" and "taraxacerin" of earlier investigators are regarded as indefinite mixtures.

***293. "Studies in the diphenyl series. Part III. Diphenyldiphthalamic acids and pyronine colouring matters containing the diphenyl group." By John Cannell Cain and Oscar Lisle Brady.**

Diphthalamic acids of benzidine, tolidine, and dianisidine are produced by the interaction of phthalic anhydride and the diamine at 100° in the presence of nitrobenzene. They condense with

resorcinol in the presence of zinc chloride to give colouring matters of the formula:



(where R = H, Me, or OMe).

These colouring matters are also obtained by heating a mixture of (i) the diamine, phthalic anhydride, and resorcinol with zinc chloride; (ii) fluorescein, the diamine, and the hydrochloride of the diamine; and (iii) the diphthalimino-derivative of the diamine with resorcinol and zinc chloride.

On bromination they yield octabromo-derivatives which can also be obtained by heating eosin with the diamine and the hydrochloride of the diamine.

The reaction appears to be a general one, as it takes place when di- and tetra-chlorophthalic or succinic anhydrides are used instead of phthalic anhydride, and when diethyl-*m*-aminophenol is substituted for resorcinol. Condensation takes place also with quinol, catechol, and pyrogallol, but in these cases the colouring matters produced are brown, and probably have a constitution different from the above.

Discussion.

Dr. J. T. Hewitt drew attention to the interesting difference existing between the compound obtained by the authors and fluoresceinanilide. The latter was a colourless substance, and probably had a lactam constitution.

***294. "Viscosity and association. Part III. The existence of racemic compounds in the liquid state." By Ferdinand Bernard Thole.**

The application of the viscometric method to the solution of the problem of the existence of racemic compounds in the liquid state has been extended to a much wider range of substances, both in solution and in the fused state.

The results obtained for viscosity and other physical properties have also been correlated.

In the present work the results obtained show that the majority of *dl*-liquids and solutions are merely conglomerates. Under this heading fall *ac*-tetrahydronaphthol, heptan-β-ol, octan-β-ol, carvoxime, octyl hydrogen phthalate, and ethyl mandelate.

On the other hand, distinct evidence of the existence of a liquid racemate has been found with dimethyl and diethyl racemates and *l*-menthyl *r*-mandelate. To these may be added the cases of racemic acid and perhaps *r*-mandelic acid previously investigated.

In the cases where racemate existence in solution has been substantiated dissociation is very considerable, and increases with increasing dilution of the solution.

The degree of dissociation at a given concentration and the rate of dissociation with dilution depend on the nature of the solute and the solvent, a condition which is paralleled by the ionic dissociation of salts dissolved in various solvents.

Discussion.

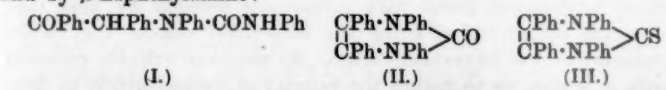
Mr. Thole agreed with the President that tartaric acid and its esters were undoubtedly associated, and that the degree of association would be influenced by racemate formation.

This point had, in fact, been brought out in a previous communication on this subject.

In reply to Dr. McKenzie's question as to the identity of solutions prepared from racemic acid and from equal quantities of the enantiomorphs, the author stated that this point had been tested and the identity of the solutions established. The menthyl mandelates had been investigated, both in the fused state and in solution in amyl acetate. Although this liquid was one of the least dissociating solvents, dissociation of the racemic solute was very considerable, and probably in dissociating solvents such as alcohol or water dissociation would be practically complete.

295. "The condensation of α-keto-β-anilino-αβ-diphenylethane and its homologues with phenylcarbimide and with phenylthiocarbimide." By Sidney Albert Brazier and Hamilton McCombie.

α-Keto-β-anilino-αβ-diphenylethane and phenylcarbimide when heated together yield *desyl-s-diphenylcarbamide* (I). This compound, on treatment with alcoholic hydrogen chloride, loses the elements of water, yielding 1:3:4:5-*tetraphenyl*-2:3-*dihydro*-2-*glyoxalone* (II). The reaction has been extended also to the compounds in which aniline has been replaced by *o*-, *m*-, and *p*-toluidine, and by β-naphthylamine:



(I.) (II.) (III.)

The phenylcarbimide has also been replaced by phenylthiocarb-

imide, resulting in the production of 1:3:4:5-*tetraphenyl*-2:3-*dihydro*-2-*glyoxalthione* (III) and its homologues.

The glyoxalones and the glyoxalthiones were found to be very stable substances, unaffected by acids, alkalis, or phosphorus pentachloride.

The glyoxalones yield salts with picric acid, but not with hydrochloric acid. These picrates can be divided into two classes, namely, (1) those formed by the aniline, *p*-toluidine, and *β*-naphthylamine compounds are red, and consist of two molecules of the base combined with one molecule of picric acid; and (2) those formed by the *o*- and *m*-toluidine compounds are yellow, and consist of the base and picric acid in equimolecular proportions.

296. "The influence of the sodium salts of organic acids on the rate of hydrolysis by alkali." By George Senter and Fritz Bulle.

The main results of the investigation are as follows:

(1) Sodium salts of organic acids, like the corresponding salts of inorganic acids, have only a slight effect on the rate of hydrolysis of ethyl acetate in alkaline solution.

(2) Sodium salts of organic acids accelerate the hydrolysis of sodium bromoacetate by alkali to a still greater extent than do the salts of inorganic acids.

(3) This effect has been traced, taking the case of sodium acetate as typical, to the intermediate formation of esters of sodium glycollate (for example, sodium acetylglycollate), which are hydrolysed by alkali as fast as they are formed.

(4) From the extent to which the hydrolysis of ethyl acetate by alkali is retarded by monosodium salicylate, a provisional estimate of the second acid dissociation-constant of salicylic acid at 20° has been made.

297. "Photo-kinetics of sodium hypochlorite solutions." By William Cudmore McCullagh Lewis.

Aqueous solutions of sodium hypochlorite, both neutral and alkaline, are photochemically decomposed, the principal products of decomposition being sodium chloride and oxygen. This reaction cannot be brought about with measurable velocity by heat rays alone, the active region being the blue-violet end of the visible spectrum and the ultraviolet region. By means of suitably coloured filters it is possible to reduce the velocity of decomposition to zero. Since the photochemical decomposition is in the same direction as

that followed, although very slowly, in the dark, the effect of the light is a catalytic one. The reaction proceeds completely after sufficient exposures, no measurable equilibrium point being obtained.

298. "The constitution of aconitine." (Preliminary note.) By Oscar Lisle Brady.

On treating aconitine with concentrated nitric acid a vigorous action takes place, and from the reaction mixture a compound can be obtained, which crystallises readily from alcohol, and melts and decomposes at 200—205°.

This compound gives a strong nitroso-reaction; the solution in aqueous potassium hydroxide, on warming, becomes brown, and the substance cannot be reprecipitated with acids. By distillation with potassium hydroxide, dimethylamine was obtained. From the mother liquor, after acidifying, acetic and benzoic acids were isolated, indicating that the benzoyl and acetyl groups of the aconitine remain in this compound. The substance is a carboxylic acid, and forms a silver salt; this is, however, unstable, and deflagrates on heating, and attempts to determine its molecular weight have given very discordant results. The following results were obtained on analysis: C=53·8; H=5·5; N=5·8; OMe=12·4 per cent.

So far as can be judged, this compound is a simple benzenoid substance containing at least one methoxy- and one carboxyl group, and the dimethylamino-, nitroso-, acetyl, and benzoyl groups.

An aqueous solution of chromic acid precipitates from an acid solution of aconitine an insoluble *dichromate*, $C_{34}H_{47}O_{11}N,H_2Cr_2O_7$. This substance on warming with dilute sulphuric acid gives a viscid mass, which was not further investigated. By the action of potassium permanganate in acid solution a crystalline substance is obtained, which is identical with that to which Carr (this vol., p. 253) has given the name oxonitin. The author's analytical results (Found, C=59·5, 59·9; H=6·4, 6·4; OMe=18·2 per cent.) and molecular-weight determination by the ebullioscopic method in chloroform (431) agree well with the formula, $C_{23}H_{29}O_9N$, assigned to this substance; other properties, such as solubility and melting point, also agree.

The suggestion that the substance is a carboxylic acid seems unlikely in view that it is insoluble in cold alkalis; it seems probable that the compound is a ketone or an aldehyde, as there is some indication of the formation of a semicarbazone, but the preparation is rendered difficult owing to the insolubility of the

compound. This substance has also been obtained in much better yield by the action of potassium permanganate in neutral solution.

From the mother liquors after separation of oxonitin a crystalline *bromo*-compound was obtained melting above 300°. (Found, C = 40·9; H = 5·4 per cent.)

299. "Properties of mixtures of ethyl alcohol, carbon tetrachloride, and water." By Thomas Henry Hill.

Ethyl alcohol and carbon tetrachloride give a mixture boiling constantly at 65·2° and containing 16·05 per cent. of the former component. The above three liquids also give a constant-boiling mixture, which distils at 61·8°, and has the following percentage composition as ascertained by the middle-point distillation method of S. Young: carbon tetrachloride, 86·3; alcohol, 10·3; water, 3·4.

300. "The behaviour of brass on heating in hydrogen at temperatures below the melting point." By Ernest Alfred Lewis.

While making some experiments to ascertain if oxygen was an essential constituent of brass, the author noticed that, on heating brass in pure dry hydrogen at a temperature of between 700° and 800°, zinc volatilised to a large extent. In the preliminary experiments the brass was heated for one or two hours, and it lost under these conditions from 10 to 20 per cent. of its weight. Further experiments were made, in which the brass was heated for three, six, nine, and twelve hours. It was found that the whole of the zinc could not be driven off even after twelve hours' heating, 3 or 4 per cent. of zinc remaining behind.

The following result is typical of the experiments. 1·001 Gram of very pure brass containing 69·85 per cent. of copper lost 0·272 gram on heating for twelve hours, and the resulting metal contained 96·68 per cent. of copper.

It was further found that if small quantities of tin were present in the brass it did not volatilise, but lead was found to be practically completely volatile. It was noticed that beautiful, microscopical crystals of zinc formed in the cooler part of the tube, but the greater part of the zinc condensed as globules.

Another remarkable result of the experiments was that the metal, after heating, did not become brittle at all; in fact, a piece of sheet brass, heated in hydrogen until a large proportion of its zinc had volatilised, was found when cold to be quite soft and not in the least brittle like a cast and rolled copper sheet would become under the same treatment, due to loss of oxygen.

It may now be considered as proved that chemically combined oxygen is not an essential constituent of alloys of copper and zinc as it is of copper.

301. "Inositol and some of its isomerides." By Hugo Müller.

The author has continued his investigations on inositol and some of its isomerides, and showed that scyllitol, which was prepared from certain organs of plagiostomous fishes by Staedeler and Frerichs (*J. pr. Chem.*, 1858, **73**, 48), and quercine, obtained from acorns by Vincent and Delachanal (*Compt. rend.*, 1887, **104**, 1855), are identical with cocositol isolated by the author from cocos-palm leaves, and described in 1907 (*Trans.*, **91**, 1767), and, as scyllitol was the first of these substances to be discovered, this name will be retained in future to represent them all.

The author described the action of solutions of hydrogen iodide and hydrogen chloride in acetic acid on inositol hexa-acetate, inositol, scyllitol hexa-acetate, and scyllitol, and showed that the action of hydrogen chloride gives rise to the formation of inositolchlorohydrin, $C_6H_6Cl(OH)_5$ (m. p. 185°); inositolchlorohydrin triacetate, $C_6H_6Cl(OH)_2(O{\cdot}CO{\cdot}CH_3)_3$ (m. p. 145°); and three isomeric modifications (α-, β-, and γ-) of inositolchlorohydrin penta-acetate, $C_6H_6Cl(O{\cdot}CO{\cdot}CH_3)_5$, which melt respectively at 247°, 110°, and 118°.

From the mother liquors of the products of all the above-mentioned reactions two new isomerides of inositol were isolated, namely, iso*inositol*, which crystallises in large, transparent crystals melting at 244°, and yields a crystallised *hexa-acetate* (m. p. 112°), and *ψ-inositol*, which is a microcrystalline substance, very soluble in water; the *acetate* is amorphous.

Scyllitol hexa-acetate, when heated with hydrogen bromide in glacial acetic acid, gave derivatives identical with those formerly obtained by the same reaction from inositol hexa-acetate.

302. "The catalytic decomposition of nitrosotriacetonamine by alkalis." By Douglas Arthur Clibbens and Francis Francis.

The discovery of a method whereby triacetonamine can be readily prepared in quantity has led to a re-investigation of the decomposition of the nitroso-derivative of this base by means of alkalis. It has been found that the nitrosoamine is catalytically decomposed by hydroxyl ions, giving nitrogen and a nearly quantitative yield

of phorone. This method is by far the easiest yet described for the preparation of this unsaturated ketone.

Experiments have been carried out in aqueous and aqueous-alcoholic solutions with varying concentrations of sodium hydroxide, the corresponding values of the constant for a unimolecular reaction being determined by measurements of the rate of evolution of nitrogen. This kinetic investigation of the reaction has shown that in all probability the decomposition, except over a range from about 0·05*N*- to 0·3*N*-NaOH, will afford a method for the quantitative determination of hydroxyl ions, comparable to that which Bredig and Fraenkel have found for hydrogen ions in the decomposition of diazoacetic ester.

303. "Chlorides of the mercurialkyl- and mercurialkylaryl-ammonium series, and their constitution as based on conductivity measurements." By Prafulla Chandra Rây and Nilratan Dhar.

The preparation of the following compounds was described: (1) Mercurimethylammonium chloride, (2) mercuri*iso*butylammonium chloride, (3) mercuripiperazinium chloride, (4) mercuribenzylammonium chloride, (5) mercuribenzylmethylammonium chloride, (6) mercuribenzylethylammonium chloride, (7) mercuriethylenediammonium chloride, (8) mercuripyridinium chloride, (9) mercuripicolinium chloride, (10) mercurinicotinium chloride, (11) mercuripiperidinium chloride, and (12) mercurihexamethylenetetra-ammonium chloride. Although these salts are generally regarded as insoluble, they have been found to be sufficiently soluble to lend themselves to conductivity measurements. It is found that they all conform to the ammonium type of salts.

304. "Position-isomerism and optical activity; halogen derivatives of methyl dibenzoyltartrate." By Percy Faraday Frankland, Sidney Raymond Carter, and Ernest Bryan Adams.

The preparation and properties of the dichloro-, dibromo-, and di-iodo-benzoyl derivatives of methyl tartrate were described. In each series the order of the rotatory power of the compounds, para>meta>dibenzoyl>ortho, is maintained. The rotations were determined in the fused state and over a range of temperature from about 20° to 100°. The rotations as a whole diminish with rise of temperature, but the rotation of each of the ortho-compounds attains a maximum value below the melting point, as already found by one of the authors in the case of ethyl dibenzoyl- and of ethyl and methyl di-*o*-toluoyl-tartrates. Incidentally, the *anhydrides* of *p*-chloro- and *m*- and *p*-iodo-benzoic acids have been prepared.

305. "Reactivity of the halogens in organic compounds. Part VII. The formation of intermediate compounds in the hydrolysis of sodium bromoacetate." By George Senter and Thomas John Ward.

The effect of sodium acetate and of sodium formate on the rate of hydrolysis of sodium bromoacetate has been measured, and the intermediate formation of sodium salts of glycollic esters has been proved by comparison of the results with those to be anticipated on the view that consecutive reactions take place during the hydrolysis.

The rate of hydrolysis of acetylglycollic acid and of sodium acetylglycollate in neutral and alkaline solution and the influence of neutral salts on the rates of reaction have been measured.

Evidence was adduced to show that during the hydrolysis of sodium bromoacetate in fairly concentrated solution the reaction proceeds mainly by means of the intermediate formation and hydrolysis of sodium bromoacetylglycollate.

306. "2-Phenyl-1 : 4 : 5 : 6-tetrahydropyrimidine and benzoyl-αγ-diaminopropane." By Gerald Eyre Kirkwood Branch and Arthur Walsh Titherley.

Numerous attempts to prepare benzoyl-αγ-diaminopropane,

$$NH_2\cdot[CH_2]_3\cdot NH\cdot COPh,$$

from αγ-diphthaliminopropane as starting point proved unsuccessful. It is not possible to eliminate one phthalyl residue from this compound, or to rupture one of the rings, or to obtain the initially desired compound,

$$C_6H_4\langle\begin{matrix}CO\\CO\end{matrix}\rangle N\cdot[CH_2]_3\cdot NH\cdot CO\cdot C_6H_4\cdot CO_2H,$$

from the corresponding diphthalamic acid. The latter, moreover, even on cautious hydrolysis, suffers loss of both phthalyl residues.

Attempts on other lines to prepare benzoyl-αγ-diaminopropane were also unsuccessful; but its synthesis was finally effected from benzamidine and αγ-dibromopropane through 2-phenyl-1 : 4 : 5 : 6-tetrahydropyridine by the following steps:

$$CPh(:NH)\cdot NH_2 \xrightarrow{C_3H_6Br_2} CPh(:NH)\cdot NH\cdot[CH_2]_3\cdot Br,HBr \xrightarrow{\text{Benzamidine}}$$

$$CPh(:NH)\cdot NH\cdot[CH_2]_3\cdot Br \xrightarrow{\text{Tautomeric change}} CPh\langle\begin{matrix}N\cdot[CH_2]_3\cdot Br\\NH_2\end{matrix}\rangle \longrightarrow$$

$$CPh\langle\begin{matrix}N\text{—}CH_2\\NH\cdot CH_2\end{matrix}\rangle CH_2 \xrightarrow[\text{ammonia at } 80^\circ]{\text{Dilute aqueous}} NH_2\cdot[CH_2]_3\cdot NH\cdot COPh.$$

2-Phenyl-1 : 4 : 5 : 6-Tetrahydropyrimidine.

Benzoyl-αγ-diaminopropane.

2-*Phenyl*-1 : 4 : 5 : 6-*tetrahydropyrimidine*, which has previously been obtained in an impure form as an oil by Pinner (*Ber.*, 1893, **26**, 2122), is a crystalline solid, melting at 72°, which is not very soluble in water. Its oxalate melts at 175°, and hydrogen oxalate at 180°. On benzoylation the base yields tribenzoyl-αγ-diaminopropane, $NBz_2 \cdot [CH_2]_3 \cdot NHBz$ (m. p. 144°).

Benzoyl-αγ-diaminopropane crystallises in transparent prisms melting at 46°. It is readily soluble in water, and its oxalate melts at 196°. On benzoylation it yields *s*-dibenzoyl-αγ-diaminopropane (m. p. 151°).

307. "The magnetic rotation of binary mixtures." By Frédéric Schwers.

In a binary mixture of liquids, between the changes of density C_v and of magnetic rotation C_r, there is a ratio Z (rotation constant), which possesses as a whole the same properties as the ratio A (refraction constant) between the changes of density and those of refractive power C_n. The common points are:

(1) For a given system, Z is independent of the concentration.

(2) The value of Z diminishes with the decrease of wave-length.

(3) The value of Z is characteristic for each system, and follows some general rules, as, for instance:

(*a*) If we consider the mixtures of one liquid successively with the different terms of an organic series, Z decreases from the first term upwards.

(*b*) If we compare the solution of a liquid in water and in alcohol, we find a higher Z-value for the last-named solution.

(*c*) The values of Z in a carbon disulphide solution are much smaller (three to six times) than in the case of the corresponding aqueous solution; the mixtures with carbon disulphide are also particularly interesting, because they show that the general rules are the same, whether the mixture undergoes a dilatation or a contraction (aqueous mixtures).

(4) In case the mixture undergoes electrolytic dissociation, Z increases with the dilution (=ionisation).

The difference consists in the fact that Z is always smaller than A. For the aqueous mixtures examined, Z has the average value of one-third of A; but this cannot be regarded as a general rule, as it is only one-sixth for carbon disulphide mixtures.

ADDITIONS TO THE LIBRARY.

I. *Donations.*

Bayliss, *William Maddock.* The nature of enzyme action. 2nd edition. London 1911. pp. xi + 137. 3*s.* 6*d.* net. (*Recd.* 11/11/12.) From Dr. R. H. A. Plimmer.

Hübner, *Julius.* Bleaching and dyeing of vegetable fibrous materials. London 1912. pp. xxiii + 434. ill. 14*s.* net. (*Recd.* 21/11/12.) From the Author.

[**Field,** *Frederick*]. The Chemical Alphabet. pp. 4. (*Reference.*) From Mr. William Spiller.

Plimmer, *R. H. Aders.* The chemical constitution of the proteins. Part I. Analysis. 2nd edition. London 1912. pp. xii + 188. 5*s.* net. (*Recd.* 2/7/12.)

From the Publishers: Messrs. Longmans, Green and Co.

Pope, *Frank George.* Modern research in organic chemistry. London 1912. pp. xii + 324. ill. 7*s.* 6*d.* (*Recd.* 19/9/12.)

From the Publishers: Messrs. Methuen and Co.

Royal Society of London. The Record of the Royal Society of London. 3rd edition. London 1912. pp. viii + 483. ill. 15*s.* (*Reference.*) From the Royal Society.

—— The signatures in the first Journal-Book and the Charter-Book. Being a facsimile of the signatures of the Founders, Patrons, and Fellows of the Society from the year 1660 down to the present time. London 1912. pp. x + 94 + 42. £3 3*s.* (*Reference.*)

From the Royal Society.

Richards, *Percy Andrew Ellis.* Practical chemistry, including simple volumetric analysis and toxicology. 2nd edition. London 1912. pp. x + 149. 3*s.* net. (*Recd.* 14/9/12.)

From the Publishers: Messrs. Baillière, Tindall and Cox.

Thole, *Ferdinand Bernard.* A second year course of organic chemistry for technical institutes. The carbocyclic compounds. London 1912. pp. vi + 186. 2*s.* 6*d.* (*Recd.* 19/9/12.)

From the Publishers: Messrs. Methuen and Co.

Villavecchia, *Vittorio.* Dizionario di merceologia e di chimica applicata. Vol. II. Milano [1912]. pp. [773]. (*Reference.*)

From the Publisher: Ulrico Hoepli.

II. *By Purchase.*

Grüss, *J.* Biologie und Kapillaranalyse der Enzyme. Berlin 1912. M. 16.—. vi + 227. (*Recd.* 16/11/12.)

Hoff, *J. H. van't* [and others]. Untersuchungen über die Bildungsverhältnisse der ozeanischen Salzablagerungen insbesondere des Stassfurter Salzlagers. Edited by *H.* **Precht** and *Ernst*

Cohen. Leipzig 1912. pp. xx+374. ill. M. 16.—. (*Recd.* 14/11/12.)

Molinari, *Ettore.* Treatise on general and industrial inorganic chemistry. Translated by *Ernest* Feilmann. London 1912. pp. xvi+704. ill. 21*s.* net. (*Recd.* 14/11/12.)

Pick, *Ernst P.* Biochemie der Antigene. Jena 1912. pp. viii+184. M. 6.50. (*Recd.* 14/11/12.)

RESEARCH FUND.

A meeting of the Research Fund Committee will be held in December next. Applications for grants, to be made on forms which can be obtained from the Assistant Secretary, must be received on, or before, Monday, December 2nd, 1912.

All persons who received grants in December, 1911, or in December of any previous year, whose accounts have not been declared closed by the Council, are reminded that reports must be in the hands of the Hon. Secretaries not later than Monday, December 2nd.

The Council wish to draw attention to the fact that the income arising from the donation of the Worshipful Company of Goldsmiths is to be more or less especially devoted to the encouragement of research in inorganic and metallurgical chemistry. Furthermore, that the income due to the sum accruing from the Perkin Memorial Fund is to be applied to investigations relating to problems connected with the coal-tar and allied industries.

At the next Ordinary Scientific Meeting on **Thursday, December 5th, 1912, at 8.30** p.m., there will be a ballot for the election of Fellows, and the following papers will be communicated:

"A study of some organic derivatives of tin as regards their relation to the corresponding silicon compounds." By T. A. Smith and F. S. Kipping.

"Contributions to the chemistry of the terpenes. Part XV. Synthesis of a menthadiene from carvacrol." By G. G. Henderson and S. P. Schotz.

"The action of halogens on silver salts." By H. S. Taylor.

"The formation of tetrahydro-oxazoles from α-hydroxy-β-anilino-αβ-diphenylethane and its homologues." By H. L. Crowther and H. McCombie.

"The precipitation of lead thiosulphate and its behaviour on boiling with water." By W. H. Perkins and A. T. King.

"Studies on cyclic ketones. Part II." By S. Ruhemann and S. I. Levy.

CERTIFICATES OF CANDIDATES FOR ELECTION AT THE NEXT BALLOT.

N.B.—The names of those who sign from "General Knowledge" are printed in *italics*.

The following Candidates have been proposed for election. A ballot will be held on December 5th, 1912.

Amies, Edwin John, B.Sc.

10, Salisbury Road, Thorpe Hamlet, Norwich.

Science Master, Hitchin Grammar School. B.Sc., First Class Honours (London), 1911. A.R.C.S. 1908–1911: First Class Chemistry.

T. E. Thorpe. James C. Philip.
M. O. Forster. W. N. Haworth.
Chapman Jones.

Bailey, William Llewelyn,

Central Buildings, Matlock, Derbyshire.

Student. Member of the Pharmaceutical Society. Student of the Institute of Chemistry. Student in the Laboratory of the Public Analyst for the County of Derby.

T. R. Hodgson. J. R. Appleyard.
Geo. Clayton. *F. E. Needs.*
T. S. Haines.

Baker, James Henry Young,

86, Chestnut Avenue, Hamilton, Ontario, Canada.

Chief Chemist of the Dominion Sugar Refining Co., Canada. Seven years as Assistant Analyst at Messrs. A. Lyle and Sons, London. Eight years as Chief Analytical Chemist of Messrs. Fowler, Ltd., Blackwall, London; now Chief Analyst at Dominion Sugar Co., Canada.

A. E. Dunstan. R. W. Wilson.
F. B. Thole. W. H. Barker.
E. D. Griffiths.

Bowack, Douglas Anderson,

15, Belsize Square, Hampstead, London.

Analyst, etc. I received my early training at the City and Guilds, Finsbury College, 1900–1902, and afterwards worked under the supervision of Dr. Arthur Lapworth as a Demonstrator in Chemistry and Research Assistant at the Goldsmiths' Institute, New Cross, London, S.E. From 1905 to 1907 was employed at the Imperial Institute, as Junior Assistant Chemist under Prof. Wyndham R. Dunstan. From 1908–1911, as Chemist, Laboratory Manager, and Lecturer under the Directorship of Mr. John Stewart Remington, Aynsome Analytical and Technical Laboratories, Lancs. Have contributed original work on cellulose, and conducted investigations in the technology of Paper Making. Latterly been associated with Mr. C. F. Cross, of Messrs. Cross and Bevan, London.

Raphael Meldola.	Arthur Lapworth.
Harold G. Colman.	Ernest Goulding.
Thomas Anderson Henry.	*B. H. Buttle.*

Buckle, Edmund Arthur,

Beech Villa, Guest Road, Prestwich, Manchester.

Chemist. Research on aniline dyestuffs containing sulphur. Research and improved process for the production of ammonia from calcium cyanamide. Research and improved process for the extraction of the self-contained water in peat. Patent specification, No. 10,370, 1912.

Jas. Grant.	*F. G. Richards.*
F. S. Sinnatt.	*H. F. Coward.*
S. J. Peachey.	*E. L. Rhead.*

Challinor, Richard Westman,

"Quidington," Emmerick Street, Leichhardt, Sydney, N.S.W.

Lecturer in Organic Chemistry and Teacher of Chemistry, Sydney Technical College. Training at Sydney Technical College and Sydney University (Honours in Chemistry). Fellow, Institute of Chemistry (1909); Member, Society of Chemical Industry. Paper on "The Approximate Colorimetric Estimation of Nickel and Cobalt in Presence of one another," Royal Society, N.S.W., 7/12/04. Twelve years' experience in teaching Chemistry.

Charles E. Fawsitt.	T. U. Walton.
J. A. Schofield.	F. B. Guthrie.
Henry G. Smith.	*Robt. D. Watt.*

Coombs, Frank Andrew,
Sydney, New South Wales, Australia.

Lecturer, Tanning Department, Sydney Technical College. Scientific training for the Tanning Industry at Otago and Sydney Universities. Contributions: *Soc. Chem. Ind.*, March 15, 1912; *Technical Gazette, New South Wales*, Feb., 1912, p. 52; *Leather World* (London), 1911, p. 269; Member of International Association, Leather Trades Chemists.

Charles E. Fawsitt. — T. U. Walton.
J. A. Schofield. — John C. H. Mingaye.
Henry G. Smith. — F. B. Guthrie.

Dixon, Walter Henry,
51, High Street, East Grinstead.

Chemist and Pharmacist, M.P.S. For several years in the Chemical, Galenical and Analytical Laboratories of Herrings & Company, 40, Aldersgate Street, and subsequently engaged in local analytical work.

David J. Williams. — J. Stuart Hills.
E. H. Farr. — *W. L. Howie.*
E. W. Lucas. — *J. Adam Watson.*
Arthur W. Crossley.

Dodds, H. H., M.Sc.,
Umbogintwini, Natal.

Chemist. For three years student in the Chemical Dept. of the Manchester University; Honours in Chemistry. For two years research chemist in Messrs. Kynoch's Arklow Works. Now chief chemist, Explosives Works, Umbogintwini, Natal.

Harold B. Dixon. — Ch. Weizmann.
W. H. Perkin. — E. C. Edgar.
Norman Smith.

Dyson, James Harry,
North Lea, St. Ives Road, Skircoat Green, Halifax.

Soap manufacturer. City and Guilds of London Certificate for Soap Manufacture. Certificates for Advanced Inorganic and Organic Chemistry. To keep in touch with the latest researches of the chemical trade.

John Denton. — *Franklin W. Walker.*
E. W. Smith. — *Edward M. Chaplin.*
C. A Crook. — *Arthur W. Cooke.*

Ellis, Ridsdale,

Chalfont House, 20, Queen's Square, Bloomsbury, London.

Patent Agent. B.Sc. in Electrochemistry, Mass. Inst. of Tech., Boston, U.S.A. Papers on Oil Emulsions and Colloids in *J. Soc. Chem. Ind.*, *Amer. Electrochem. Soc.*, and the *Zeit. f. Phys. Chemie.*

F. G. Donnan. F. Thomas.
R. E. Slade. H. Bassett, jun.
A. W. Titherley.

Elsdon, George Davidson,

City Analyst's Laboratory, Birmingham.

Senior Assistant Analyst to the City of Birmingham. Lecturer on Chemistry at the Walsall Municipal Technical Institute. B.Sc.(Birm.): Honours in Chemistry. Priestley Research Scholar. Associate of the Institute of Chemistry. Two papers in the *Analyst*; two papers in the *Transactions of the British Pharmaceutical Conference*; one paper in the *Chemical News*; one paper in the *Journal of the Society of Chemical Industry.*

Percy F. Frankland. Hamilton McCombie.
Edward P. Frankland. C. K. Tinkler.
H. E. Smith.

Gadd, Sydney Charles,

31, S. David's Hill, Exeter.

Analytical Chemist. Engaged for the last thirteen years in the evaluation of drugs, the standardisation of pharmaceutical products, and the analysis of water, foods, etc. Contributions on chemical and allied subjects to the *Pharmaceutical Journal*, the *Chemist and Druggist*, and the *British Pharmaceutical Conference.*

W. H. Lewis. J. H. Cooper.
F. Southerden. Thomas Tickle.
H. Wippell Gadd.

Gray, Harold Heath, B.Sc.,

University Hall, More's Gardens, Cheyne Walk, Chelsea, S.W.

Lecturer in Fuel and Refractory Materials at the Imperial College of Science and Technology, S. K. First Class Honours B.Sc. (Manc.) in Chemistry under Professors Dixon and Perkin. Two years Assistant Lecturer and Demonstrator in Metallurgy and Assaying at McGill University, Montreal, with Prof. A. Stansfield, D.Sc. Three years Assistant Lecturer and Demonstrator at Leeds University in the Department of Fuel and Metallurgy with Professor Bone, during

which time did Research on High Pressure Gaseous Explosions under the direction of, and in collaboration with, him.

William A. Bone.	W. H. Perkin.
Harold B. Dixon.	Ch. Weizmann.
E. C. Edgar.	Norman Smith.

Hale, Arthur James, B.Sc. (Lond.), A.I.C.,
53, Gowrie Road, Lavender Hill, S.W.

Lecturer and Demonstrator of Chemistry, City and Guilds Technical College, Finsbury. Former Student at Chelsea and Borough Polytechnics. Lecturer in Chemistry and Physics, Waterford Technical Institute, Jan. 1907—Oct. 1910. Assisted Dr. F. M. Perkin in preparation of "Practical Methods of Inorganic Chemistry." Author of "Practical Chemistry for Engineering Students," Longmans, 1912.

Raphael Meldola.	H. Drake Law.
F. Mollwo Perkin.	*J. Bernard Coleman.*
B. H. Buttle.	*F. H. Lowe.*

Haydon, Archie,
55, Grove Lane, Kingston, Surrey.

Assistant to T. Hughes, Esq., F.I.C., F.C.S., Public Analyst, for the past three years. For two and a-half years Assistant to P. Edgerton, Esq., F.C.S., Consulting Chemist. Student of the Battersea Polytechnic. Four years training at Shebbear College, N. Devon.

Thomas Hughes.	John Wilson.
Percy Edgerton.	J. L. White.

B. A. Posford.

Hope, Edward, M.Sc.,
Lockingstoops, Lowton, Newton-le-Willows, Lancs.

Demonstrator in Chemistry, Manchester University. Late Dalton Chemical Scholar, and Schunck Research Assistant, Manchester University. M.Sc. Manchester. Author and joint-author of papers in the publications of the Chemical Society.

Harold B. Dixon.	A. Lapworth.
W. H. Perkin.	A. Holt.
F. P. Burt.	Norman Smith.

J. E. Myers.

Jamas, A. N. Peston, M.A., B.Sc.,
Karrim Building, Grant Road, Bombay.

Geologist, Eastern Syndicate, Ltd., London. M.A. with Chemistry and B.Sc. with Chemistry and Geology of the Bombay University.

Worked as a Chemical Analyst in the Technochemical Laboratory, Bombay. Sometime State Geologist and Chemical Adviser, State of Jamnagar. I always take interest in the Chemical Science and desire to promote my knowledge thereon.

Alex. R. Normand. E. M. Modi.
T. K. Gajjar. *A. Weighell.*
A. S. Lindley.

Jobling, Edgar,

H.M. Patent Office, Southampton Buildings, W.C.

Assistant Examiner in Patent Office. National Scholar, Governor's Scholar, Tyndall and Frank Hatton Prizeman; Royal College of Science, London, S.W. Associate of the Royal College of Science. Bachelor of Science (London: First Class Honours in Chemistry). Post-graduate research at the above College. At present, researching at the Birkbeck College, London, E.C.

G. T. Morgan. F. P. Dunn.
James C. Philip. J. C. Withers.
M. O. Forster. Alex. McKenzie.

Komatsu, Shigeru,

Institute of Chemistry, College of Science and Engineering, Kyoto Imperial University, Kyoto, Japan.

Assistant Professor of Chemistry. Contributions to Chemistry: (1) Isomeric phenyl phthalimides and some allied compounds, I, II. (with Prof. Kuhara): *Mem. Coll. Sci. Eng. Kyoto*, I, 391; II, 365. (2) Amine salts of phthalamic, phenylphthalamic, and phenylsuccinamic acids (*Ibid.*, I, 431). (3) Synthesis of thiohydantoin (*Ibid.*, III, 1).

Joji Sakurai. Toyokichi Takamatsu.
Tamemasa Haga. Hikorokuro Yoshida.
Masumi Chikashigé.

Lankshear, Frederick Russell, B.A., M.Sc.,

Dalton Hall, Victoria Park, Manchester.

Lecturer in Chemistry in the University of Manchester. Author of following papers: "On Epicamphor" (with Prof. W. H. Perkin); "Absorption Spectra of Camphorquinone Derivatives" (with Dr. Lapworth); "On Manganese Trioxide," in the *Proceedings of the Chemical Society.*

Harold B. Dixon. E. C. Edgar.
W. H. Perkin. Arthur Lapworth.
Ch. Weizmann. Norman Smith.

Levy, Stanley Isaac,

St. John's College, Cambridge.

Student; engaged in research with Dr. Ruhemann. B.A. (Cambridge): First Class in Nat. Sci. Tripos, Parts I. and II. (Chemistry). B.Sc. London: First Class Honours in Chemistry.

S. Ruhemann. H. O. Jones.
E. J. Holmyard. W. J. Pope.
Charles T. Heycock. W. J. Sell.

Lomax, Ernest Lawson,

Mowbreck, Farington, near Preston, Lancs.

Petroleum Chemist. Master of Science, Victoria University, Manchester. Johnstone Chemical Scholar, Durham University, 1903–4. Research Chemist, Woolwich Arsenal, two years. Petroleum chemist, six years. Joint author with F. C. Garrett, D.Sc., of "Determination of Sulphur in Petroleum and Bituminous Minerals," *Journal of the Society of Chemical Industry*, 1905, 1212, 1213.

Boverton Redwood. Chas. W. Moore.
W. H. Perkin. F. G. P. Remfry.
E. C. Edgar. R. G. Neilson.

Morrell, George Francis,

7, Claylands Road, Kennington Gate, S.W.

Assistant Lecturer at Sir John Cass Institute. Ph.D.(Kiel); B.Sc. Hons. Chem. (Lond.); A.I.C.

Arthur W. Crossley. Charles A. Keane.
Charles H. Warner. H. Burrows.
J. F. Spencer.

Mumford, Ernest Moore, B.Sc.,

75, High Street, Chorlton-on-Medlock, Manchester.

Chemist. B.Sc. Honours in Chemistry, Manchester University. Assistant to Dr. Fowler, Lecturer in Bacteriological Chemistry in the University of Manchester.

Gilbert J. Fowler. E. C. Edgar.
Harold B. Dixon. J. E. Myers.
W. H. Perkin. Ch. Weizmann.
Norman Smith.

Newman, Leslie Frank,

Downing College, Cambridge.

Advisory Chemist in Agriculture for the South Eastern Counties

(Camb. Univ.). B.A. (Camb.), Univ. Dip. Agr. Research Scholar for three years under Professor T. B. Wood.

T. B. Wood. H. A. D. Neville.
F. G. Hopkins. Charles T. Heycock.
R. H. Adie.

Nichols, William Moore,

205, Hugh Street, Castleford.

Analytical Chemist, Specialising Brewing Chemistry. Studied Chemistry with E. G. McBretney, Esq., F.I.C.; later, a Student at the Wakefield Technical School. More than two years with E. M. Chaplin, Esq., Ph.D., F.I.C., Public Analyst for Wakefield and Lincoln. Now Controlling Chemist to F. Fawcett, Esq., Maltster, Castleford.

Edward M. Chaplin. B. A. Burrell.
E. G. McBretney. *F. W. Richardson.*
L. Gordon Paul.

Nierenstein, Maximilian,

30, Cavendish Road, Henleaze, Bristol.

Lecturer in Bio-chemistry, University of Bristol. Ph.D. (Berne). Has been engaged in research work on Organic and Bio-chemical lines since 1902, and has published several papers in the *Berichte*, *Annalen*, and other journals.

F. W. Rixon. Philip J. Worsley.
H. W. Bywaters. Francis Francis.
James W. McBain.

Orange, Lionel,

148, Barkworth Road, N. Camberwell, London, S.E.

Senior Science Master, Shebbear College, Shebbear, near Highampton, N. Devon, since Sept., 1911. B.Sc. London, First Class Honours in Chemistry, 1910. Student under Dr. J. T. Hewitt at East London College, 1907–1910.

J. T. Hewitt. Frank G. Pope.
Clarence Smith. *W. H. Ratcliffe.*
Arthur E. Pitt.

Paniker, Ramni,

c/o Messrs. Röhm & Haas, 4, Quai St. Clair, Lyons, France.

Leather Trades Chemist. M.A. (Madras University, Chemistry); M.Sc. (Leeds University, Applied Chemistry, Leather Manufacture). "Acid Character of Gallotannic Acid," by Paniker and Stiasny, *J.C.S.*, October, 1911.

Arthur Smithells. J. B. Cohen.
Henry R. Procter. H. M. Dawson.
A. G. Green.

Patterson, John William,

88, Park Road, West Dulwich, London, S.E.

Pharmaceutical Chemist. Chemist to a firm of Manufacturing Pharmaceutical Chemists, Messrs. G. Curling, Wyman & Co., 58 and 59, Bunhill Row, London, E.C. Member of the Pharmaceutical Society. Pereira Medallist, 1902.

Carter White. R. Ernest Jackson.
Harold Rogerson. James Brown.
William C. Reynolds.

Potter, Charles Etty,

9, Church View, Church Lane, Heckmondwike, Yorks.

Teacher of Chemistry. B.Sc. Victoria (Manchester), June, 1900. Joint author of contributions to the Chemical Society (*J.C.S.*, 1902–3–4), with Dr. H. A. D. Jowett. Lecturer in Chemistry, Batley Technical School.

Arthur Smithells. J. B. Cohen.
W. Lowson. H M. Dawson.
Frederick B. Power.

Rakshit, Jitendra Nath,

11/1, Babar Urijapur Road, Calcutta.

Assistant to the Customs and Excise Chemist, India. Author: "On Sodium Diacetamide and Potassium Acetamide," *Journal Asiatic Society, Bengal* (1902). Joint author with Prof. P. C. Rây, "Methylammonium Nitrite" (*Trans.*, **99**, 1016); "Nitrites of the Alkylammonium Bases," Parts I, II, III, IV (*Trans.*, **99**, 1470; **101**, 141, 217, 613); "Trimercuridiethylammonium Nitrite" (*Trans.*, **99**, 1972), etc., etc. Awarded Elliot Gold Medal for researches in 1912 by the Asiatic Society of Bengal.

M. N. Banerjee. P. C. Rây.
Jyoti Bhushan Bhaduri. *C. L. Bose.*
R. L. Jenks. *B. C. Dutt.*

Remers, Martin,

24, Chorley Old Road, Bolton.

Physician. Student in Chemical and Pharmaceutical Laboratories of the Manchester University. Minor Qualification of Pharmaceutical Society; L.R.C.P., Edinburgh; L.R.C.S., Edinburgh.

Harold B. Dixon. Norman Smith.
W. H. Perkin. Alfred Holt.
E. C. Edgar. *J. E. Myers.*

Roper, Herbert Carr,

42, Cavendish Place, Newcastle-on-Tyne.

Pharmacist. Engaged for the past twenty-one years in manufacturing, analysing, and dispensing drugs and pharmaceutical compounds, and greatly interested in the chemical constitution of medicinal substances.

N. H. Martin. J. T. Dunn.
Frederick N. Binks. *P. Phillips Bedson.*
F. C. Garrett.

Sasson, Albert,

Alexandria, Egypt.

Inspector of Agriculture (Egypt). Member of the Royal Agricultural College, Cirencester, and Gold Medallist. Student, 1903–1905. Desirous of keeping up knowledge of Agricultural Chemistry.

Edward Kinch. W. H. Cadman.
J. A. Voelcker. *A. Lucas.*
W. B. Pollard.

Scarborough, Harold Archibald,

60, Highbury Terrace, Hill Street, Coventry.

Research Student. B.Sc. (Honours), Birmingham.

Percy F. Frankland. C. K. Tinkler.
Hamilton McCombie. J. E. Coates.
E. P. Frankland. H. E. Smith.
Ernest Vanstone. John Wilfrid Parkes.

Scott, Walter,

2, Wordsworth Avenue, Cardiff.

Technical and Analytical Chemist. Technical and Analytical Chemist in Cardiff, after acting as Chemist for Messrs. Powell, Duffryn Co., Ltd., South Wales, for past seven years. I have made, and am now making, a close investigation into the subject of Lubrication, and Oils and Greases generally.

Harold Gripper. Jas. Grant.
William J. Pope. *F. G. Richards.*
Edmund Knecht. *F. S. Sinnatt.*

Seal, Kunjo Behary,

5, Nilmony Dutt Lane, Calcutta, India.

Head Analytical Assistant to the Custom and Excise Chemist, Government of India. Head Assistant in the Laboratory of the Chemical Examiner to Government, Bengal, and Head Lecture-

Assistant to the Professor of Chemistry, Medical College, Calcutta, from 1896 to 1904; Head Analytical Assistant, Central Excise Laboratory for India under Lieut.-Col. Sir C. H. Bedford, M.D., D.Sc., I.M.S., from 1904 to 1911; Head Analytical Assistant to the Custom and Excise Chemist, Government of India, since January, 1912; Assistant to the Lecturer of Chemistry, Indian Association for the Cultivation of Science, Calcutta, for many years. Assisted generally in all the original Excise Investigations for the Government of India, namely: (1) Quality, manufacture, and Excise control of alcoholic liquors in India (1906). (2) Report on denaturation of alcohol in India (1907). (3) Standards of quality for beer in India (1907). (4) Corrected Sikes' Tables for use with glass hydrometer (1909). (5) Report on contamination of country spirit by copper salts (1910). (6) Tables for the reduction of spirit of strengths between 65 O.P. to 70 U.P. (1910). (7) Custom observation Report (1911).

Chuni Lal Bose. Haradhan Ray.
Amrita Lal Sircar R. L. Jenks.

Manindra Nath Banerjee.

Sladden, Cyril Edgar,

12, Charleville Circus, Sydenham, S.E.

Assistant Demonstrator at the Imperial College of Science and Technology, South Kensington. B.A. Oxford, Second Class Honours, Natural Science (Chemistry), 1912.

H. Brereton Baker. Henry F. Harwood.
James C. Philip. P. W. Robertson.

Oscar L. Brady.

Smith, Thomas Alfred,

3, Colegrave Street, Lincoln.

Chemical Research Assistant. B.Sc. (Hons. Lond.); A.I.C. At present engaged in research with Prof. F. S. Kipping at University College, Nottingham, and Lecturer at Loughborough Technical Institute.

F. Stanley Kipping. H. J. S. Sand.
R. M. Caven. Robert Robison.

Frederick Challenger.

Smith, William Charles,

Church Lane, Lowton, Newton-le-Willows.

Analytical Chemist to Anchor Cable Co., Leigh, Lancs. For six years as assistant to Messrs. Stanger & Blount, Westminster; three

years with R. H. H. Stanger, of Westminster; and the last four years as Chemist to the Anchor Cable Co., Leigh (Messrs. Callenders).

Bertram Blount. S. Dickson.
W. J. A. Butterfield. R. H. Harry Stanger.
C. T. Blanshard.

Steele, Victor,

438, New Cross Road, New Cross, S.E.

Lecturers' Assistant, Chemical Department, Guy's Hospital, S.E. Lecture Assistant, Chemical Department, Goldsmiths' College, New Cross, 1905—1910. Research Chemist at South Metropolitan Gas Co. until 1912. Joint Author with Dr. Lapworth of two papers in the *Transactions* (1911, **99**, 1877, and 1911, **99**, 1882), and author of "The Action of Hydrogen Cyanide on Carvone Hydrosulphide" (Proc., 1911, **27**, 240).

Arthur Lapworth. Richard William Merriman.
George Barger. Harold Rogerson.
J. H. Ryffel.

Stephen, Alfred Ernest,

Bank of New South Wales, Sydney, New South Wales, Australia.

Delegate for Australasia of the Chilian Nitrate Committee. Two and a-half years with W. A. Dixon, F.I.C., F.C.S., and G. A. Byrn, F.I.C., F.C.S., Public Analysts, Sydney. Four and a-half years Analyst to the Pacific Phosphate Co., Ltd. (London), at Sydney and South Sea Islands. Three and three-quarter years Chief Metallurgical Chemist (*a*) Lachlan Gold Fields, Ltd., N.S.W.; (*b*) Great Cobar, Ltd., Cobar, N.S.W. Three years Assistant Propagandist for German Potash Syndicate in Australia, etc., etc.

Bernard Dyer. *J. A. Voelcker.*
Arthur R. Ling. *E. W. Voelcker.*
John Hughes. *Arthur W. Crossley.*

Till, William Compton,

Barnacle House, Coventry.

At present engaged in private research. M.Sc. (Birm.). Nearly two years original research on Biological Chemistry, including work on "The Interaction of Dextrose with Various Organic Substances," and "The Acid Production of a Bacterium Allied to Saccharobacillus Pastorianus."

Percy F. Frankland. Thomas H. Pope.
Adrian J. Brown. Douglas F. Twiss.
Hamilton McCombie.

Tsao, Hui Chun,

I-Hing, Kiang-Su, China.

Student of Chemistry and Metallurgy. B.Sc. (Birm.).

Percy F. Frankland. J. E. Coates.

Hamilton McCombie. C. K. Tinkler.

Thomas Turner.

Ure, Paul Jenner,

c/o Dr. Ure, George Street, Brisbane, Queensland, Australia.

Assistant Teacher and Lecturer in Chemistry, Assaying, Mineralogy, and Geology atCentral Technical College, Brisbane. Student about three years at Brisbane Technical College. Associate Diploma in Chemistry, Assaying, Mineralogy and Geology with honour. Teaching experience: Four years teaching at the Brisbane and Central Technical Colleges, Brisbane. Now Public Assayer and Metallurgical Chemist.

George J. Saunders. Leonard C. Green.

J. Brownlie Henderson. *J. A. Schofield.*

Basil Turner.

The following Certificates have been authorised by the Council for presentation to ballot under Bye-law I(3):—

Douglas, James Crawford,

Christmas Island, Straits Settlements.

Analytical Chemist. Studied Chemistry (inorganic and organic) at the Technical College, Glasgow. Hold Honours certificate (South Kensington) for Chemistry (practical and theoretical); six years Assistant Chemist to Messrs. Alex. Cross & Sons, Ltd., Glasgow. At present Chemist to the Christmas Island Phosphate Co., Ltd. Desire to have the Society's Journal and other publications.

William Smellie Anderson. *Isidor M. Heilbron.*

G. G. Henderson. *Forsyth James Wilson.*

Edmund J. Mills.

Grützmacher, Frederick Lyle,

Technical College, Rockhampton. Queensland, Australia.

Science Lecturer. Lecturer in Chemistry, Mineralogy and Geology, and Director of Science Department, Rockhampton Technical College; formerly Science Master, Rockhampton Grammar School. Explosives Analyst for Harbour Board, Rockhampton.

Edward H. Rennie. *J. Brownlie Henderson.*

Hilbert, Max,

Hamburg, Germany.

Manufacturing Chemist, Essential Oil Importer and Exporter. Contributor, Investigator and Author in connexion with Sicilian and Calabrian oils, in particular in connexion with the purity of Oil of Lemon.

John C. Umney. *Frank L. Teed.*
C. T. Bennett. *H. Mansfield.*

Maxwell, Francis,

77, Lawrie Park Road, Sydenham, London.

Chemical and Technical Advisor of the factories of the Credit Foncier of Mauritius. Certificated Chemist of the Brunswick Sugar Institute. Ingénieur of the Swiss Federal Polytechnikum and A.M.I.M.E. Inventor of his procédé of making white sugar direct from the sugar-cane as in operation in Mauritius.

Walter M. Gardner. *Barker North.*
F. W. Richardson. *H. Middleton.*
A. B. Knaggs.

Natrajan, Tanjore S.,

Bixandarkoil, Trichinopoly.

Professor of Chemistry S.P.G. College, Trichinopoly. Worked in the Chemical and Physical laboratories (for the B.A. and M.A. Courses for five years), Presidency College, Madras.

A. K. Yegna Narayan Aiyer. *H. V. Krishnayya.*

Nowak, Carl Alfred,

2739 Mildred Avenue, Chicago, Ill., U.S.A.

Head Research Chemist and Instructor in Chemistry and Physics, The Wahl-Henius Institute of Fermentology, Chicago, Ill. B.Sc. with Honours, University of Chicago, 1910. Member and Abstractor, American Chemical Society. Member Bureau of Barley and Hop Industry. Author of Paper on "The Materials used in the Manufacture of Filtermass," *8th Inter. Congress of Applied Chem.*, and "Conductivity Cell," *J. Ind. Eng. Chem.*, Sept. 1912. Contributor Scientific Dep. *American Brewer's Rev.* Inventor and Patentee Carbontetrachlorid Emulsion, U.S. Patent 1,038,783.

Max Henius. Alexander Smith.
Alan W. C. Menzies.

R. CLAY AND SONS, LTD., BRUNSWICK ST., STAMFORD ST., S.E., AND BUNGAY, SUFFOLK.

[*Issued* 12/12/12

PROCEEDINGS

OF THE

CHEMICAL SOCIETY.

Vol. 28 No. 407.

Thursday, December 5th, 1912, at 8.30 p.m., Dr. M. O. FORSTER, F.R.S., Vice-President, in the Chair.

Captain G. I. Davys was formally admitted a Fellow of the Society.

The CHAIRMAN announced that the Council had decided:

(1) That in order to obtain a more equal division of abstracts, those of Physiological Chemistry and the Chemistry of Vegetable Physiology and Agriculture shall, in future, be included in Part I. of the Abstracts, instead of in Part II.

(2) That persons requiring expanded Abstracts or translations of papers published in other Journals should apply to the Editor. Ten shillings per printed page (about 500 words) will be charged, and payment should be made to the Editor at the time the request for a translation or fuller abstract is forwarded to him.

Certificates were read for the first time in favour of Messrs.:

Theodore William Gull Acland, B.A., 19, Bryanston Square, W.
Albert Brier, M.Sc., 19, Alexander Road, Ulverston.
Charles George Cutbush, 59, Byne Road, Sydenham, S.E.
Thomas Lenton Elliott, Lincoln House, Heckmondwike, Yorks.
Robert Gilmour, B.Sc., Ph.D., Scores Villa West, St. Andrews.
James Arthur Hewitt, B.Sc., 3, South Bridge Street, St. Andrews.

William Joseph Holt, 31, Spruce Hills Road, Walthamstow, N.E.
Paul Murphy, Burnside, Sidcup, Kent.
Jonathan Harold Naylor, M.Sc., 73, Castle Street, Bolton.
Harold Victor Taylor, Royal College of Science, S. Kensington, S.W.
Percy James Thompson, The Avenue, Clytha Square, Newport, Mon.
Thomas Willoughby Turnill, Stibbington, Wansford, Northamptonshire.
Edward Webb, B.Sc., Berwyn, Totteridge, Whetstone.

A Ballot for the election of Fellows was held, and the following were subsequently declared duly elected:

Edwin John Amies, B.Sc.
William Llewelyn Baily.
James Henry Young Baker.
Douglas Anderson Bowak.
Edmund Arthur Buckle.
Richard Westman Challinor.
Frank Andrew Coombs.
Walter Henry Dixon.
H. H. Dodds, M.Sc.
James Crawford Douglas.
James Harry Dyson.
Ridsdale Ellis, B.Sc.
George Davidson Elsdon, B.Sc.
Sydney Charles Gadd.
Harold Heath Gray, B.Sc.
Frederick Lyle Grützmacher.
Arthur James Hale, B.Sc.
Archie Haydon.
Edward Hope, M.Sc.
Ardesir Naservanji Peston Jamas, M.A., B.Sc.
Edgar Jobling, B.Sc.
Shigeru Komatsu.
Frederick Russell Lankshear, B.A., M.Sc.
Stanley Isaac Levy, B.A., B.Sc.
Ernest Lawson Lomax, M.Sc.
Francis Maxwell.
George Francis Morrell, Ph.D., B.Sc.
Ernest Moore Mumford, B.Sc.
Tanjore S. Natrajan.
Leslie Frank Newman, B.A.
William Moore Nichols.
Maximilian Nierenstein, Ph.D.
Carl Alfred Nowak, B.Sc.
Lionel Orange, B.Sc.
Ramni Paniker, M.A., M.Sc.
John William Patterson.
Charles Etty Potter, B.Sc.
Jitendra Nath Rakshit.
Martin Remers, L.R.C.P., L.R.C.S.
Herbert Carr Roper.
Albert Sasson.
Harold Archibald Scarborough, B.Sc.
Walter Scott.
Kunjo Behary Seal.
Cyril Edgar Sladden, B.A.
Alfred Thomas Smith, B.Sc.
William Charles Smith.
Victor Steele.
Alfred Ernest Stephen.
William Compton Till, M.Sc.
Hui Chun Tsao, B.Sc.
Paul Jenner Ure.

Of the following papers those marked * were read:

***308. "Chemical reactivity and absorption spectra. Part II. The variation in absorption produced by a solvent." By Edward Charles Cyril Baly and Francis Owen Rice.**

In two previous papers (Trans., 1912, **101**, 1469, 1475) it was pointed out that every chemical molecule must be the centre of a condensed field of force. Each individual atom in any given

molecule possesses a certain amount of free affinity, which must be accompanied by the existence of lines of force in its immediate neighbourhood. Inasmuch as there exist two types of this affinity, acid and basic, it follows that the independent existence of these lines of force in a molecule must be a metastable condition, and that the various force lines must condense together with the escape of free energy. The chemical reactivity of the resulting condensed system will be very much reduced, and in some cases may fall to zero. It has been shown how these systems can be unlocked by the action of light, and how the reactivity thereby may be increased. In many cases the closed system can partly be opened by the influence of a solvent, and under the influence of light they may still further be opened. A quantitative measure of the amount of light absorbed by substances at various concentrations in suitable solvents has been carried out.

As a result of this theory it would be expected, in the case when a substance is opened up by a solvent, that the amount of light absorbed should increase with the dilution until a maximum is reached. Further dilution should then cause a decrease in the amount of light absorbed, and finally the solution should become diactinic. This result has experimentally been found.

***309. "Studies in the camphane series. Part XXXIII. Orientation of Tiemann's *iso*aminocamphor." By Martin Onslow Forster and Hubert Arthur Harry Howard.**

Tiemann's *iso*aminocamphor, produced by the action of hydriodic acid on camphoroxime, was found to have the amino-group in the position occupied by the substituent in β-chlorocamphor, β-bromocamphor, and Reychler's camphorsulphonic acid. It is therefore re-named β-aminocamphor, and by hydrolysing the hydroxycamphor *semicarbazone*, $C_{11}H_{19}O_2N_3$, which arises by exchange of the amino-group for hydroxyl when semicarbazide acetate acts on β-aminocamphor, *β-hydroxycamphor*, $C_{10}H_{16}O_2$, has been prepared; the substance is short-lived, rapidly changing into the isomeric dihydrocampholenolactone.

310. "A study of some organic derivatives of tin as regards their relation to the corresponding silicon compounds." By Thomas Alfred Smith and Frederic Stanley Kipping.

As the results of a comparison of optically active derivatives of tin with the corresponding silicon compounds might lead to important conclusions, attempts have been made to synthesise *dl*-dibenzylethylpropylstannanesulphonic acid,

$$SnEtPr(CH_2{\cdot}C_6H_5){\cdot}CH_2{\cdot}C_6H_4{\cdot}SO_3H,$$

by methods analogous to those employed in the preparation of dibenzylethylpropylsilicanesulphonic acid (Challenger and Kipping, *Trans.*, 1910, **97**, 142, 755). These experiments were successful only up to a certain point, for although *dibenzylethylpropylstannane* was, in fact, obtained, the *dl*-monosulphonic derivative of this compound could not be prepared.

The following benzyl and benzylalkyl derivatives of stannic chloride were described: *Dibenzylstannic chloride, bromide, iodide,* and *acetate*; *tetrabenzylstannane, tribenzylethylstannane, dibenzyldiethylstannane,* and *dibenzylethylpropylstannane. Ethylpropylstannic chloride* was also obtained.

311. "Contributions to the chemistry of the terpenes. Part XV. Synthesis of a menthadiene from carvacrol." By George Gerald Henderson and Schachno Peisach Schotz.

Carvomenthol, $C_{10}H_{19}\cdot OH$, prepared by hydrogenating carvacrol according to the method of Sabatier and Senderens, yields Δ^1-menthene, $C_{10}H_{18}$, when heated with anhydrous oxalic acid. The hydrocarbon forms an oily dibromide, $C_{10}H_{18}Br_2$, which, when heated with alcoholic potassium hydroxide or with anhydrous sodium acetate and acetic acid, is converted into a *menthadiene*, $C_{10}H_{16}$, a colourless liquid with a pleasant odour, which boils at 172—174°.

It was expected that the product of these reactions would be either α- or β-phellandrene, but this was not the case; at least, it could not be converted into a nitrite. On the other hand, the menthadiene obtained in this way from carvacrol has considerable resemblance to the corresponding hydrocarbon formerly obtained from thymol by a similar process, although it has not been proved that they are identical.

312. "The action of halogens on silver salts." By Hugh Stott Taylor.

Iodine reacts with silver salts in a manner analogous to that observed in reactions with chlorine and bromine, to yield insoluble silver iodide, hypoiodous acid, and another acid. The reaction occurring may be represented by the equation:

$$AgX + I_2 + H_2O = AgI + HIO + HX.$$

Owing to the instability of hypoiodous acid, a second reaction occurs, accelerated by rise of temperature, increase in concentration, or presence of soluble silver salts, in which the hypoiodous acid is converted into iodide and iodate. This secondary reaction may be generally represented thus:

$$3HIO + 3AgX = 2AgI + AgIO_3 + 3HX.$$

The progress of this second reaction has been followed in various concentrations of the reacting solutions.

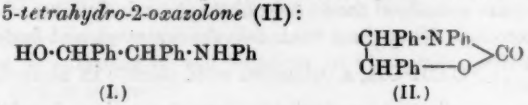
The simple equation of Birnbaum (*Annalen*, 1869, **152**, 111) and of Normand and Cumming (*Trans.*, 1912, **101**, 1852):

$$3I_2 + 3H_2O + 6AgX = 5AgI + AgIO_3 + 6HX$$

represents the sum of the two preceding equations.

313. "The formation of tetrahydro-oxazoles from α-hydroxy-β-anilino-αβ-diphenylethane and its homologues." By Horace Leslie Crowther and Hamilton McCombie.

Tetrahydro-oxazoles cannot be prepared from the dihydro-oxazoles described by McCombie and Parkes (*Trans.*, 1912, **101**, 1991) by simple reduction. If, however, α-keto-β-anilino-αβ-diphenylethane is reduced to the corresponding hydroxy-compound (I) by means of sodium amalgam in alcohol, this compound then undergoes condensation with carbonyl chloride to yield 3:4:5-*triphenyl*-2:3:4:5-*tetrahydro*-2-*oxazolone* (II):



(I.) (II.)

Similar compounds have been prepared from the corresponding *m*- and *p*-toluidines and β-naphthylamine analogues of (I).

The tetrahydro-oxazoles obtained are very stable substances, which resist the action of reducing agents and phosphorus trichloride, and do not form salts with hydrochloric acid or with picric acid.

Attempts were also made to condense α-hydroxy-β-anilino-αβ-diphenylethane and its homologues with thionyl chloride and sulphuryl chloride, but these were unsuccessful.

314. "The precipitation of lead thiosulphate and its behaviour on boiling with water." By William Hughes Perkins and Albert Theodore King.

The addition of sodium thiosulphate to a solution of lead acetate produces a precipitate the composition of which varies with the dilution of the solutions, and with the proportions in which they are mixed. From concentrated solutions, especially those containing excess of the lead salt, the precipitate consists of the double salt $Pb(C_2H_3O_2)_2,2PbS_2O_3$, whilst from dilute solutions or with excess of thiosulphate it has a composition corresponding with PbS_2O_3. It is therefore advisable when pure lead thiosulphate is required to obtain it from lead nitrate. The well-known blackening of this

salt on warming takes place most readily in the presence of excess of sodium thiosulphate according to the equation

$$PbS_2O_3 + 3Na_2S_2O_3 = PbS + 4S + 3Na_2SO_4.$$

Without the sodium salt the reaction is slower and more complex, but it still proceeds mainly according to the equation

$$4PbS_2O_3 = PbS + 4S + 3PbSO_4.$$

The authors' results are in conflict with those of Fogh (*Ann. Chim. Phys.*, 1890, [vi], **21**, 56), who prepared his thiosulphate from moderately concentrated lead acetate solution, and represented its decomposition on boiling by the equation

$$2PbS_2O_3 = PbS + PbS_3O_6.$$

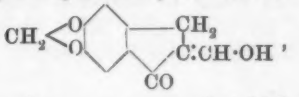
315. "Studies on cyclic ketones. Part II."

By Siegfried Ruhemann and Stanley Isaac Levy.

The work on cyclic ketones (Ruhemann, *Trans.*, 1912, **101**, 1729) has been continued on the same lines as before; in particular, the authors have examined the hydroxymethylene derivatives of various cyclic ketones. They find that 2-*hydroxymethylene*-1-*hydrindone*, $C_6H_4<\begin{matrix}CH_2\\CO\end{matrix}>C{:}CH{\cdot}OH$, a colourless solid soluble in alcohol, undergoes on warming a remarkable transformation, involving the elimination of one molecule of formic acid from two molecules of the substance; the condensation product,

$$C_6H_4<\begin{matrix}CH_2\\CO\end{matrix}>C{:}CH{\cdot}CH<\begin{matrix}CH_2\\CO\end{matrix}>C_6H_4,$$

is a deep red solid, insoluble in alcohol, and decomposing at 232°. The corresponding methylenedioxy-derivative,



undergoes the same change at a somewhat higher temperature; but the hydroxymethylene derivatives of 1:3-dimethyl-Δ^3-*cyclo*hexen-5-one, $CHMe<\begin{matrix}C(CH{\cdot}OH){\cdot}CO\\CH_2\text{——}CMe\end{matrix}>CH$, which is a yellow oil, and of 1-methyl*cyclo*pentan-3-one, $CHMe<\begin{matrix}CH_2{\cdot}CO\\CH_2{\cdot}C{:}CH{\cdot}OH\end{matrix}$, which is a very volatile, colourless solid, can both be distilled in a vacuum without change.

In other respects the hydroxymethylene derivatives of the hydrindone series resemble those already examined by Claisen and his pupils; thus they yield green copper salts, and anilides, and react with semicarbazide, and with phenylhydrazine, in the latter case forming pyrazole derivatives.

316. "**Some hydrogen ferrocyanides.**" **By Herbert Ernest Williams.**

By treating solutions of the ferrocyanides of the alkali or alkaline earth metals with hydrochloric acid, ferrocyanic acid is liberated.

The ferrocyanides of the heavy metals, however, behave differently; thus, when cupric ferrocyanide is boiled with concentrated hydrochloric acid, half of the copper is replaced by hydrogen, and there is obtained a yellow, insoluble *cupric hydrogen ferrocyanide*, $CuH_2Fe(CN)_6,4H_2O$.

In a similar manner, but with slight variation of conditions, such as lower temperature or diluted acid, double hydrogen salts of nickel, cobalt, manganese, zinc, and cadmium can be obtained.

By these means the following compounds have been prepared and examined: *Cobalt hydrogen ferrocyanide*, $CoH_2Fe(CN)_6,4H_2O$; *manganese hydrogen ferrocyanide*, $MnH_2Fe(CN)_6,5H_2O$; and *nickel hydrogen ferrocyanide*, $NiH_2Fe(CN)_6,3H_2O$.

These acid salts are insoluble in water, and decompose alkali carbonates readily with liberation of carbon dioxide, and when digested in solutions of the chlorides of the alkali metals, hydrochloric acid is liberated.

The cupric salt, when digested with solutions of potassium or ammonium chlorides, liberates two equivalents of hydrochloric acid, and forms the corresponding cupric potassium or cupric ammonium ferrocyanide respectively.

With potassium chloride the reaction is represented by the equation:

$$CuH_2Fe(CN)_6 + 2KCl = CuK_2Fe(CN)_6 + 2HCl.$$

With sodium chloride solution in the cold only half the hydrogen of the copper compound is replaced, thus:

$$CuH_2Fe(CN)_6 + NaCl = CuNaHFe(CN)_6 + HCl,$$

forming the triple salt, *cupric sodium hydrogen ferrocyanide*, which has a dirty brown colour. When this triple salt is digested in a solution of potassium or ammonium chloride, the remaining hydrogen atom is replaced, forming one equivalent of hydrochloric acid and cupric sodium potassium or cupric sodium ammonium ferrocyanide respectively.

317. "**The formulæ of ipuranol and some related compounds.**" **By Frank Tutin and Hubert William Bentley Clewer.**

In a paper published some time ago (*Amer. J. Pharm.*, 1908, **80**, 264) Power and Rogerson described the isolation from *Ipomœa purpurea* of a substance which was designated ipuranol, and since then the same compound has repeatedly been obtained from a

variety of plants. The analysis of the ipuranol, and of its acetyl derivative, appeared to indicate that the substance in question was a dihydric alcohol possessing the formula $C_{23}H_{38}O_2(OH)_2$. It has since been observed, however, that the analytical results agree equally well for a higher formula, $C_{29}H_{47}O_2(OH)_3$. The present authors have recently analysed benzoylipuranol, when figures were obtained which were not in harmony with the formula

$$C_{23}H_{38}O_4(CO{\cdot}C_6H_5)_2,$$

but were in exact agreement with those theoretically required for the tribenzoyl derivative of a substance possessing the higher formula mentioned above. In the following table the theoretical analytical figures for the two formulæ are compared:

	$C_{23}H_{38}O_2(OH)_2$.	$C_{29}H_{47}O_2(OH)_3$.
Required for alcohol.....	C=72·6 ; H=10·5.	C=72·8 ; H=10·5.
,, ,, acetyl derivative ...	C=69·8 ; H= 9·5.	C=69·5 ; H= 9·2.
,, ,, benzoyl derivative ...	C=75·5 ; H= 8·2.	C=76·0 ; H= 7·8.

A molecular-weight determination of the acetyl derivative was subsequently made, when the value 607 was obtained, compared with 604 required for $C_{29}H_{47}O_5(CO{\cdot}CH_3)_3$ and 464 required for $C_{23}H_{38}O_4(CO{\cdot}CH_3)_2$. It is thus evident that ipuranol is a trihydric alcohol, possessing the formula $C_{29}H_{47}O_2(OH)_3$.

Similarly, it has been ascertained that cluytianol possesses the formula $C_{29}H_{46}O(OH)_4$, and not $C_{23}H_{37}O(OH)_3$, as recently stated (this vol., p. 265).

Power and Moore (*Trans.*, 1910, **97**, 102) described the isolation from colocynth of a new alcohol, designated as citrullol, which appeared to possess the formula $C_{22}H_{36}O_2(OH)_2$, thus being a lower homologue of ipuranol. A small quantity of this substance being available, it has now been re-investigated, with the result that it has been ascertained that citrullol should be represented by the formula $C_{28}H_{45}O_2(OH)_3$, a conclusion which is quite in harmony with the analytical results obtained by Power and Moore. The citrullol examined was analysed, with the following result:

0·0923 gave 0·2448 CO_2 and 0·0859 H_2O. C=72·3; H=10·3.

$C_{28}H_{48}O_5$ requires C=72·4; H=10·3 per cent.

Power and Moore found C=72·1; H=10·4 per cent.

A molecular-weight determination of the acetyl derivative yielded the following result:

0·4019 in 23·96 benzene gave Δt −0·13°. M.W.=613.

$C_{34}H_{54}O_8$ requires M.W.=590. $C_{26}H_{42}O_6$ requires M.W.=450.

Benzoylcitrullol has not previously been described. It forms colourless needles, melting at 179—180°:

0·0947 gave 0·2640 CO_2 and 0·0650 H_2O. C=76·0; H=7·6.

$C_{49}H_{60}O_8$ requires C=75·8; H=7·6 per cent.

$C_{36}H_{46}O_6$,, C=75·2; H=8·0 ,, ,,

In view of these results it would appear probable that some, at least, of the other alcohols related to ipuranol which have been isolated may possess higher formulæ than those at present ascribed to them, but material for their re-investigation is not now available.

318. "Molecular conductivity and ionisation of nitrites." By Prafulla Chandra Rây and Nilratan Dhar.

Twenty-three nitrites have been studied from the point of view of their electrical conductivity and hydrolysis in aqueous solution. The nature of the complexes in the salts sodium mercurinitrite, $Na_2Hg(NO_2)_4$, tetramethylammonium mercurinitrite,

$$NMe_4Hg(NO_2)_3,$$

and mercurosomercurinitrite, $HgHg_2(NO_2)_5$, has been determined.

The inadequacy of the expression $A_v/A_o=\mu$ was also discussed.

319. "The latent heats of chloroform and benzene and of their mixtures between 0° and 80°." By James Fletcher and Daniel Tyrer.

A method was described for accurately determining latent heats at constant composition of mixtures over a wide range of temperature. The latent heats of pure chloroform and pure benzene and mixture of these liquids of varying compositions have been determined between the ordinary temperature and the boiling points. It is found that for any given mixture the latent heat is a linear function of the temperature, and for a given temperature the latent heat is approximately a linear function of the composition.

320. "Synthetic aminoglucosides derived from *d*-glucosamine." By James Colquhoun Irvine and Alexander Hynd.

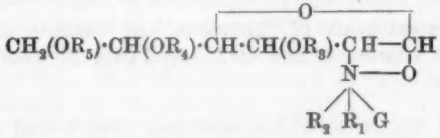
It was shown that bromotriacetylglucosamine is a general reagent for the preparation of α-aminoglucosides, as it enters into reaction with widely different types of hydroxy-compounds, giving, in the first instance, acetylated aminoglucosides, from which the acyl groups may be removed by hydrolysis.

Both the acetylated and unsubstituted aminoglucosides thus obtained may be divided into two classes, which differ in their behaviour towards hydrolytic agents, and in their capacity to form molecular complexes with metallic haloids. Some of the compounds are remarkably stable, and are only hydrolysed to give glucosamine salts when strongly heated with concentrated acid. In such cases they are also unaffected by enzymes, and form additive compounds with silver iodide.

α-Aminoglucosides of this nature are regarded as cyclic nitrogen compounds of the general type described in a previous paper (*Trans.*, 1912, **101**, 1128). The examples of this class now described are *α-aminoethylglucoside* and *α-aminoamylglucoside.*

A second type of aminoglucoside is formed when the group combined with the glucosamine residue contains a benzene ring, as then hydrolysis with dilute mineral acids proceeds quite normally, and thus the usual glucosidic formulæ may be applied to the compounds. Representative members of this class are *α-aminobenzylglucoside*, *α-aminohelicin*, *α-aminosalicin*, and *α-aminomorphineglucoside.*

In many respects acetylated aminoglucosides show a remarkable similarity in their behaviour towards both acids and alkalis to the simpler glucoproteins. The suggestion was made that the latter compounds may be constituted in an analogous manner to triacetyl-α-aminomethylglucoside, and thus conform to the general structure:



where G stands for the "glucosidic" group, and R_1, R_2, etc., for amino-acyl residues. Syntheses of complexes of this nature are now being carried out.

ADDITIONS TO THE LIBRARY.

I. *Donations.*

Allmand, *Arthur John.* The principles of applied electrochemistry. London 1912. pp. xii + 547. ill. 18*s.* net. (*Recd.* 2/12/12.)
From the Publisher: Mr. Edward Arnold.

Barclay, *William R.*, and **Hainsworth**, *Cecil H.* Electroplating. A treatise on the electro-deposition of metals, with a chapter on metal-colouring and bronzing. London 1912. pp. viii + 399. ill. 7*s.* 6*d.* net. (*Recd.* 2/12/12.)
From the Publisher: Mr. Edward Arnold.

Makower, *W.*, and **Geiger**, *H.* Practical measurements in radioactivity. London 1912. pp. ix + 151. ill. 5*s.* net. (*Recd.* 23/11/12.)
From the Publishers: Messrs. Longmans, Green & Co.

Martin, *Geoffrey,* [and others]. Industrial and manufacturing chemistry. Organic. London [1912]. pp. xx + 726. ill. 21*s.* net. (*Recd.* 3/12/12.)

From the Publishers: Messrs. Crosby, Lockwood & Son.

Mellor, *Joseph William.* Modern inorganic chemistry. London 1912. pp. xx + 871. ill. 7*s.* 6*d.* (*Recd.* 23/11/12.)

From the Publishers: Messrs. Longmans, Green & Co.

Norton, *Thomas H.* Utilization of atmospheric nitrogen. (U.S. Dept. Commerce and Labor. Bureau of manufactures. Special Agents Series, No. 52.) Washington 1912. pp. 178. ill. (*Recd.* 20/11/12.)

From the Author.

Price, *Thomas Slater.* Per-acids and their salts. London 1912. pp. iv + 123. 3*s.* net. (*Recd.* 23/11/12.)

From the Publishers: Messrs. Longmans, Green & Co.

Russell, *Edward John.* Soil conditions and plant growth. London 1912. pp. viii + 168. 5*s.* net. (*Recd.* 23/11/12.)

From the Publishers: Messrs. Longmans, Green & Co

II. *By Purchase.*

Cohen, *Ernst.* Jacobus Henricus van't Hoff. Sein Leben und Wirken. Leipzig 1912. pp. xv + 638. ill. M. 16.—. (*Recd.* 30/11/12.)

Thorpe, *Sir Edward.* A dictionary of applied chemistry. Vol. III. London 1912. pp. viii + 789. ill. £2 5*s.* net. (*Recd.* 30/11/12.)

ERRATUM.

PROCEEDINGS, 1912.

Page 238, line 22, *for* "COPh·COPh·NPh·CO_2Et" *read* "COPh·CHPh·NPh·CO_2Et."

At the next Ordinary Scientific Meeting on Thursday, December 19th, 1912, at 8.30 p.m., the following papers will be communicated:

"Dibenzyl- and diphenyl-silicols and silicones." By G. Martin.

"An attempt to harmonise the relation between temperature and rotation for light of all refrangibilities of certain active substances, both in the homogeneous state and in solution." By T. S. Patterson.

"The photography of absorption spectra." By T. R. Merton.

"The constitution of ortho-diazoimines. Part II. The *p*-tolylnaphthatriazoles." By G. T. Morgan and F. M. G. Micklethwait.

"Co-ordination compounds of vanadium. Part I. The acylacetonates." By G. T. Morgan and H. W. Moss.

"Optically active glycols derived from the phenyl-lactic acids. Part I." By A. McKenzie and G. Martin.

"Diphenylene. Part II." By J. J. Dobbie, J. J. Fox, and A. J. H. Gauge.

"A new method for the estimation of hypochlorites." By H. G. Williams.

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[*Issued* 30/12/12

PROCEEDINGS

OF THE

CHEMICAL SOCIETY.

Vol. 28. No. 408.

Thursday, December 19th, 1912, at 8.30 p.m., Professor PERCY F. FRANKLAND, LL.D., F.R.S., President, in the Chair.

Messrs. Ridsdale Ellis, E. L. Lomax, C. E. Sladden, John W. Patterson, and E. A. Cooper were formally admitted Fellows of the Society.

Certificates were read for the first time in favour of Messrs.:

John Hugh Christie, B.Sc., c/o Dr. Bean, Cross Gates, Leeds.
Roland Doumin, 76, Tannsfield Road, Sydenham, S.E.
Albert Edward Garrett, B.Sc., Yaverland, Clarence Road, St. Albans.
Douglas Henville, 67, Glencoe Street, Newington, Hull.
Thomas James Kirkland, B.Sc., Hereward Hall, Ely.
William Norman Rae, B.A., Royal College, Colombo, Ceylon.
Hermann Horace Roskin, B.Sc., 11, Newlands Road, Middlesbrough.
William Slessor Simpson, M.A., B.Sc., Dynamite Factory, Somerset West, S. Africa.

Of the following papers, those marked * were read:

***321. "A qualitative attempt to harmonise the relation between temperature and rotation for light of all refrangibilities of certain active substances, both in the homogeneous state and in solution." By Thomas Stewart Patterson.**

Evidence was adduced to show that the temperature-rotation curve for an active substance is probably irregularly periodic, and that in comparing the rotation values for different substances of a similar class account should be taken of something corresponding with phase and something corresponding with amplitude. The influence of a solvent appears to be to shift the temperature-rotation curve as a whole towards a lower or higher temperature with corresponding difference in amplitude. The maximum rotation occurs at slightly different temperatures for light of different refrangibilities, and this accounts for the phenomenon of anomalous rotation-dispersion. The influence of solvents on anomalous rotation-dispersion appears to be just the same as on the temperature of maximum rotation. The recognition of the variation of the temperature of maximum rotation appears to bring into one general scheme all the diverse phenomena of optical activity.

Discussion.

The President said that in all the six cases in which he himself had found a maximum rotation * the latter occurred at a temperature below the melting point of the substance. He suggested that the maximum in such cases might be associated with the complex condition of the liquid in the supercooled state in which two or more different kinds of molecules might be present. Some of the maxima recorded by Dr. Patterson appeared to him to have been obtained at temperatures so high that some decomposition might be feared, but he presumed that the author had taken the possibility of a spurious maximum being thus obtained into consideration.

In reply to the President, Dr. Patterson stated that the maxima observed in the temperature-rotation curves was not due in any way to decomposition of the substances on heating. In cooling from a high temperature the rotation was observed to rise and then diminish again.

* Ethyl dibenzoyltartrate, ethyl and methyl di-*o*-toluoyltartrates, methyl di-*o*-chloro-, di-*o*-bromo-, and di-*o*-iodo-tartrates.

*322. "The photography of absorption spectra." By Thomas Ralph Merton.

The photographic methods generally used for the observation of absorption spectra are not suitable for quantitative investigations owing to the complicated conditions which govern the density of a photographic plate.

A photographic method has been found for the determination of extinction curves which is free from these objections.

*323. "The constitution of ortho-diazoimines. Part II. The *p*-tolylnaphthatriazoles." By Gilbert T. Morgan and Frances Mary Gore Micklethwait.

In continuation of earlier experiments (*Proc.*, 1910, **26**, 151), attempts have been made to prepare the third isomeride, having the general formula $\alpha\beta$-$C_{10}H_6{:}N_3{\cdot}C_7H_7(p)$.

2:4-*Dinitro*-1-p-*tolyl*-*α*-*naphthylamine* (yellow needles, m. p. 196—198°), obtained by boiling 1-chloro-2:4-dinitronaphthalene and *p*-toluidine in xylene solution, yielded on complete reduction the somewhat oxidisable base 1-p-*tolyl*-1:2:4-*triaminonaphthalene* (colourless needles, m. p. 177°). The action of nitrous acid on this triamine is remarkable, as it leads to the elimination of *p*-toluidine, in the form of *p*-toluenediazonium chloride, and to the production of 2-amino-1:4-naphthaquinoneimide, a compound hitherto obtained by the action of ferric chloride on 2:4-diamino-α-naphthol. The partial reduction of 2:4-dinitro-1-*p*-tolyl-α-naphthylamine is under investigation.

*324. "Co-ordination compounds of vanadium. Part I. The acylacetonates." By Gilbert T. Morgan and Henry Webster Moss.

Vanadium terbenzoylacetonate,

$$V\left[<\begin{matrix}O{=}C(CH_3)\\ O{\cdot}C(C_6H_5)\end{matrix}>CH\right]_3,$$

dark chocolate-brown leaflets, m. p. 218—220°, was obtained by the interaction of anhydrous vanadium trichloride, benzoylacetone, and alcoholic sodium ethoxide; it is insoluble in water, and dissolves freely in chloroform or benzene. In the moist condition it oxidises to the emerald-green *vanadium oxybisbenzoylacetonate* (*vanadyl bisbenzoylacetonate*),

$$VO\left[<\begin{matrix}O{:}C(C_6H_5)\\ O{-}C(CH_3)\end{matrix}>CH\right]_2,$$

which is more readily prepared by dissolving freshly precipitated vanadyl hydroxide in an alcoholic solution of benzoylacetone.

Vanadium oxybisacetylmethylacetonate (*vanadyl bisacetylmethylacetonate*),

$$VO\left[<^{O:C(CH_3)}_{O:C(CH_3)}>C\cdot CH_3\right]_2,$$

sage-green, acicular prisms, results from the interaction of vanadyl hydroxide and alcoholic acetylmethylacetone.

The ultra-violet absorption spectra of the vanadium teracylacetonates and vanadium oxybisacylacetonates in alcoholic solution differ from those of vanadium trichloride and vanadyl dichloride in showing persistent absorption bands like the bands exhibited by the acylacetones themselves, whereas the two chlorides indicate only general absorption in dilute solutions.

325. "Dibenzyl- and diphenyl-silicols and -silicones." By Geoffrey Martin.

The author, by means of a tabular comparison between the compounds recently described by Kipping (*Trans.*, 1912, **101**, 2108 *et seq.*) and the same ones previously described by himself (*Ber.*, 1912, **45**, 403), controverted Kipping's statement (*loc. cit.*) that an erroneous account has been given of these compounds. The author pointed out that he had not described any "isomeric" diphenylsilicols in his paper (*loc. cit.*), as asserted by Kipping, and stated that Kipping had merely "rediscovered" the two modifications of diphenylsilicol described by him ten months previously (*loc. cit.*). The author maintained the correctness of his conclusion that one modification can pass into the other, and vice versa. He pointed out that Kipping himself records the passage of one modification into the other, and actually states that it is a result "which appears to be fully established" (*loc. cit.*, p. 2124).

326. "Optically active glycols derived from the phenyl-lactic acids. Part I." By Alex. McKenzie and Geoffrey Martin.

The authors have prepared and examined a number of glycols derived from esters of β-hydroxy-β-phenylpropionic acid and α-hydroxy-β-phenylpropionic acid respectively by the application of Grignard reagents.

327. "Diphenylene. Part II." By James Johnston Dobbie, John Jacob Fox, and Arthur Josiah Hoffmeister Gauge.

Certain derivatives of diphenylene, $C_6H_4{:}C_6H_4$ (*Trans.*, 1911, **99**, 683), have been prepared. A *dibromodiphenylene* melting at 171° was obtained by the action of bromine on the hydrocarbon, but at the same time a considerable amount of 2:2′-dibromodiphenyl was formed.

Nitration with a mixture of concentrated sulphuric acid and nitric acid (D 1·5) resulted in the formation of a *tetranitrodiphenylene* melting at 223°.

When diphenylene was heated with diluted nitric acid under pressure, there were formed: (1) a *dinitrodiphenylene* melting at 204°, (2) *diphenylene oxide*, (3) *3-nitrophthalic acid*. In preparing the derivatives of diphenylene, a large proportion of the parent substance was invariably converted into waxy and resinous substances.

Attempts to prepare diphenylene by other methods than that originally employed were described. Dry distillation of silver diphenate led to the formation of the lactone of 2-hydroxydiphenyl-2′-carboxylic acid, $\begin{matrix} C_6H_4{\cdot}CO \\ C_6H_4{\cdot}O \end{matrix}$, but no diphenylene was formed.

Finely-divided sodium reacted rapidly with 2:2′-dibromodiphenyl, forming diphenylene and other substances, of which one agreed in composition with the formula $C_{84}H_{56}Br_2$, and melted at 306°.

328. "A new method for the estimation of hypochlorites." By Herbert Goulding Williams.

Hypochlorites can be titrated with a *N*/10-solution of hydrazine sulphate, the end point being determined by starch-iodide paper. The action appears to be:

$$N_2H_4 + 2MOCl = N_2 + 2H_2O + 2MCl.$$

It is necessary to keep the mixture alkaline throughout, sodium hydrogen carbonate being added if required. Comparison titrations made with *N*/10-arsenic trioxide and *N*/10-hydrazine sulphate showed very close agreement.

The author finds that, contrary to the statement of Browne and Shetterly, neither ammonia nor azoimide is formed.

329. "Ethylation in the flavone group."
By Arthur George Perkin.

Although, except in the case of myricetin, fully ethylated derivatives of flavone colouring matters containing an hydroxyl adjacent to the carbonyl group have not hitherto been prepared by means of ethyl iodide and alkali, no difficulty exists in producing such compounds if an excess of the reagents is employed. Adopting the procedure found serviceable with myricetin (*Trans.*, 1911, **99**, 1725), luteolin (5 grams) gave *luteolin tetraethyl ether*, $C_{15}H_6O_2\cdot(OEt)_4$ (Found, Et = 28·67), colourless needles, m. p. 153—155° (4 grams), whereas from apigenin (5 grams), *apigenin triethyl ether*, $C_{15}H_7O_2\cdot(OEt)_3$ (Found, Et = 24·58), prismatic needles, m. p. 189—191° (4 grams), was prepared. Quercetin from rutin (10 grams) yielded *quercetin pentaethyl ether*, $C_{15}H_5O_2(OEt)_5$, colourless, prismatic needles, m. p. 116—118° (11 grams) (Found, Et = 32·86; C = 67·70; H = 6·78), and when hydrolysed with alcoholic potassium hydroxide gave protocatechuic acid diethyl ether, and the hydroxyfisetol triethyl ether, $C_{14}H_{20}O_5$, m. p. 96—97° (Found, C = 62·79; H = 7·39), previously obtained (*loc. cit.*) from myricetin hexaethyl ether. The low melting point of the quercetin pentaethyl ether suggests that this compound may prove to be dimorphous. In a similar way quercetagetin and gossypetin give fully ethylated derivatives, which will be described in a later communication, and there is evidence that other analogous ketonic compounds behave similarly under this treatment.

330. "The synthesis of some new dimethyltetrahydroquinolines."
By Arthur James Ewins and Harold King.

The synthesis of 4 : 8-dimethyl-1 : 2 : 3 : 4-tetrahydroquinoline and of the corresponding 4 : 7- and 4 : 6-dimethyl bases from the *o*-, *m*-, and *p*-toluidides of acetoacetic acid has been carried out in order to compare their properties with those of a base, α-cytisolidine, a degradation product of the alkaloid cytisine (Freund, *Ber.*, 1904, **37**, 16).

The above-mentioned toluidides have not hitherto been isolated. They were prepared by heating mixtures of the toluidine and ethyl acetoacetate, in molecular proportions, to boiling for one to one and a-half minutes. On cooling, the nearly pure toluidides separate out in good yield. On treatment with sulphuric acid at 100° for fifteen minutes they yield carbostyrils, and the latter, by reduction with sodium in alcoholic solution, the dimethyltetrahydroquinolines.

331. "The constitution of cytisine, the alkaloid of Cytisus laburnum. Part I. The synthesis of α-cytisolidine and of β-cytisolidine." By Arthur James Ewins.

By the action of hydriodic acid and phosphorus on cytisine, $C_{11}H_{14}ON_2$, at a temperature of 225—230°, Freund (*Ber.*, 1904, **37**, 16) obtained among other products a feebly basic, crystalline solid, cytisoline, $C_{11}H_{11}ON$ (m. p. 198°), and a strongly basic oil, β-cytisolidine, to which he gave the formula $C_{11}H_{15}N$. Cytisoline, on reduction with sodium in alcoholic solution, gave a strongly basic oil of the composition $C_{11}H_{15}N$, which was termed α-cytisolidine on account of its supposed isomerism with β-cytisolidine.

The constitutions of these two bases have now been established by their synthesis. α-Cytisolidine is identical with 6:8-dimethyl-1:2:3:4-tetrahydroquinoline ($C_{11}H_{15}N$), and β-cytisolidine with the corresponding 6:8-dimethylquinoline ($C_{11}H_{11}N$). The formula assigned to β-cytisolidine by Freund is thus inaccurate.

The relationship of the bases obtained by Freund must therefore be as follows:

Cytisoline, $C_{11}H_{11}ON$	(?)-Hydroxy-6 : 8-dimethylquinoline.
β-Cytisolidine, $C_{11}H_{11}N$.....	6 : 8-Dimethylquinoline.
α-Cytisolidine, $C_{11}H_{15}N$.....	6 : 8-Dimethyl-1 : 2 : 3 : 4-tetrahydroquinoline.

The constitution of cytisine, from which cytisoline is formed merely by the elimination of the elements of ammonia, remains undetermined.

332. "Some reactions of the sulphoxylic acids." By Percy May and Samuel Smiles.

Barnett and Leete (*Proc.*, 1911, **27**, 120) have shown that when thiobenzanilide is oxidised with hydrogen dioxide the corresponding thionyl derivative (I) is formed. When it is considered that

$$C_6H_5\cdot NH\cdot \underset{\underset{SO}{\|}}{C}\cdot C_6H_5 \qquad (I.)$$

$$C_6H_5\cdot N{:}\underset{\underset{SH}{|}}{C}\cdot C_6H_5 \qquad (II.)$$

thiobenzanilide and other thioamides exhibit in many of their reactions the structure of an imino-mercaptan (for example, II), it seems probable that the oxide in question would behave in a similar manner according to the isomeric formula represented by (III). The suspicion is confirmed by the fact that thiobenzanilide

$$C_6H_5\cdot N{:}\underset{\underset{SOH}{|}}{C}\cdot C_6H_5 \qquad (III.)$$

oxide yields a sodium salt, for there can be no doubt that in this substance the metal is attached to the thionyl group. It is therefore evident that under certain conditions thiobenzanilide oxide may be regarded as a sulphoxylic acid, and at the time when this investigation was planned only one other substance of this class, namely, formaldehyde sulphoxylate, had been isolated. The temporary existence of these substances in certain reactions has been frequently postulated with varying degrees of certainty, and opportunity has now been taken to test the accuracy of certain assumptions concerning their reactivities. Fromm and his collaborators (*Ber.*, 1908, **41**, 3397; 1909, **42**, 3816) have advanced the view that in alkaline solution the sulphoxylic acids are unstable, and tend to undergo simultaneous reduction and oxidation, mercaptans and various products of oxidation being formed. This is fully confirmed by the behaviour of thiobenzanilide oxide in alkaline solution. The *sodium* salt may be obtained by rapidly cooling a warm solution of the substance in 10 per cent. aqueous sodium hydroxide; it forms very pale yellow needles, which are soluble in cold water, but sparingly so in the cold alkaline medium. The salt is not stable, and if the aqueous solution is warmed it is completely decomposed, yielding benzanilide and thiobenzanilide. It is clear that the latter is formed by reduction of the oxide, and independent experiment shows that the former product is obtained when the oxide is treated with alkaline oxidising agents.

In explaining the reactions of disulphides with concentrated sulphuric acid, it has also been postulated (Prescott and Smiles, *Trans.*, 1911, **99**, 642) that the sulphoxylic acids are capable of condensing in that medium with an aromatic nucleus yielding sulphides, for example:

$$R{\cdot}SOH + HAr = R{\cdot}S{\cdot}Ar + H_2O.$$

Support is given to this assumption by the fact that thiobenzanilide oxide is almost quantitatively transformed by warm sulphuric acid into the phenylbenzothiazole, which has been previously obtained (for example, *Ber.*, 1886, **19**, 1068) in other ways:

$$C_6H_5\!<\!\overset{N}{\underset{HO{\cdot}S}{\diagup\!\diagdown}}\!>\!C{\cdot}C_6H_5 = C_6H_4\!<\!\overset{N}{\underset{S}{\diagup\!\diagdown}}\!>\!C{\cdot}C_6H_5 + H_2O.$$

Among other reactions of this oxide mention may be made of that which takes place with dry hydrogen chloride in presence of a dehydrating agent; sulphur is eliminated, and the iminochloride of benzanilide is formed as expressed by the following equation:

$$C_6H_5{\cdot}N{:}\underset{SOH}{\overset{|}{C}}{\cdot}C_6H_5 + HCl = C_6H_5{\cdot}N{:}CCl{\cdot}C_5H_5 + S + H_2O.$$

The further investigation has been abandoned owing to the recent

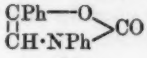
discovery (*Ber.*, 1912, **45**, 2965) of other sulphoxylic acids of less intricate structure.

333. "**The condensation of α-keto-β-anilino-α-phenylethane and its homologues with carbonyl chloride, phenylcarbimide, and phenylthiocarbimide.**" **By Hamilton McCombie and Harold Archibald Scarborough.**

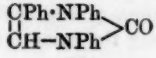
McCombie and Parkes (*Trans.*, 1912, **101**, 1991) have shown that carbonyl chloride and α-keto-β-anilino-αβ-diphenylethane can be condensed to give 3:4:5-triphenyl-2:3-dihydro-2-oxazolone. This synthesis has now been extended to α-keto-β-anilino-α-phenylethane, which with carbonyl chloride gives 3:5-diphenyl-2:3-dihydro-2-oxazolone (I). This reaction has been applied also to compounds in which aniline has been replaced by *o*-, *m*-, and *p*-toluidine and β-naphthylamine.

These oxazolones are stable compounds, and their basicity is so slight that no picrates or hydrochlorides could be isolated.

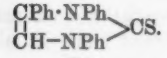
Brazier and McCombie (*Trans.*, 1912, **101**, 2352) acted on α-keto-β-anilino-αβ-diphenylethane with phenylcarbimide, and obtained 1:3:4:5-tetraphenyl-2:3-dihydro-2-glyoxalone. This reaction has now been extended to α-keto-β-anilino-α-phenylethane, which gives with phenylcarbimide, 1:3:4-triphenyl-2:3-dihydro-2-glyoxalone (II). The reaction occurs in two stages; the two compounds are heated together on a water-bath until a white mass is obtained, which on treatment with alcoholic hydrogen chloride yields the glyoxalone; the corresponding *o*-, *m*-, and *p*-toluidine and β-naphthylamine compounds have been obtained:



(I.)



(II.)



(III.)

The glyoxalones yield salts with picric acid, but not with hydrochloric acid. These picrates consist of one molecule of the base combined with one molecule of the acid.

Phenylcarbimide has been replaced by phenylthiocarbimide yielding 1:3:4-triphenyl-2:3-dihydro-2-glyoxalthione (III).

334. "**Note on the nitration of *p*-hydroxyacetophenone.**" **By Frank Geo. Pope.**

Gattermann (*Ber.*, 1892, **25**, 3523) obtained 3-nitro-*p*-hydroxyacetophenone in small yield (11 per cent.) by the condensation of *o*-nitroanisole with acetyl chloride in the presence of aluminium chloride. It crystallises in yellow needles melting at 130·5°. The

position of the nitro-group was determined by oxidising the methyl ether with dilute nitric acid to 3-nitroanisic acid, which had already been obtained by Salkowski.

Since the hydroxy-ketone is merely a *p*-substituted phenol, there appeared to be no reason why nitration should not be directly attempted, and the following experiment was consequently carried out.

3·5 Grams of the finely-powdered hydroxy-ketone were added in small quantities at a time to a well-cooled mixture of 20 c.c. of nitric acid (D 1·42) and 20 c.c. of concentrated sulphuric acid, with constant stirring. After half an hour the mixture was poured on to crushed ice, and the faintly yellow precipitate was collected, well washed, and dried. The amount of solid matter so obtained was 3·5 grams, and in the crude state melted at 128—130°. This represents a 75 per cent. yield of nitrohydroxyacetophenone.

The nitro-compound was then crystallised from boiling water, separating in slender, yellow needles, melting at 135°. (Found, N = 7·92. $C_8H_7O_4N$ requires N = 7·73 per cent.)

Hence the nitro-compound is 3-nitro-*p*-hydroxyacetophenone, and further proof is given by the fact that on methylation and subsequent oxidation with dilute nitric acid, 3-nitroanisic acid is obtained. The acid prepared in this manner melts sharply at 190—191°, whereas Salkowski gives 186—187°.

The methyl ether which was also obtained simultaneously by Gattermann is readily prepared by methylating *p*-hydroxyacetophenone in alkaline solution with methyl sulphate, and then nitrating the methyl ether in the manner described above. On oxidation with dilute nitric acid it also yields 3-nitroanisic acid (m. p. 190—191°), a mixed specimen of the acid as obtained by the two different methods also giving the same melting point.

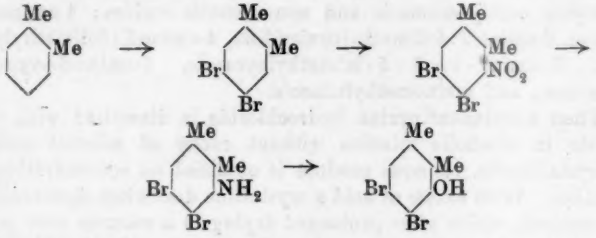
335. "Bromoxylenols obtained from dimethyldihydroresorcin. (Preliminary note.)" By Arthur William Crossley and Sydney Smith.

In 1903 Crossley and Le Sueur (*Trans.*, 1903, **83**, 110) described experiments on the action of phosphorus haloids on dimethyldihydroresorcin, and showed that both with phosphorus pentachloride and especially phosphorus pentabromide, the resulting substances readily undergo transformation into aromatic derivatives, giving in the latter case bromoxylenols. There were described a monobromoxylenol melting at 83·5—84° and a dibromoxylenol melting at 96·5°. Both these substances gave on treatment with bromine a tribromoxylenol melting at 183°, which, it was suggested, might

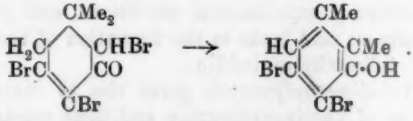
be identical with tribromo-*o*-3-xylenol melting at 184°. A second tribromoxylenol was encountered, melting at 177°.

Further work has shown that the reactions are very complicated and susceptible to the slightest variation in experimental conditions. Although by no means complete, it is considered desirable to place on record a brief summary of the definite results so far obtained, as the present authors are unable to continue the work conjointly.

(1) The monobromoxylenol, m. p. 84°, and the dibromoxylenol, m. p. 96·5°, have been proved to be derivatives of *o*-3-xylenol; and although the position of the bromine atom in the former has not yet been decided, the latter has been proved by synthesis to be 4:5-*dibromo*-o-3-*xylenol*. The synthetic formation is indicated by the following formulæ:



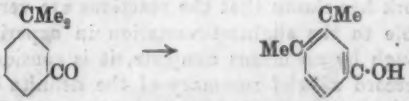
(2) 4:5-Dibromo-*o*-3-xylenol has also been obtained by the action of heat or of alcoholic potassium hydroxide on 2:4:5-tribromo-1:1-dimethyl-Δ^4-*cyclo*hexen-3-one (tribromoketodimethyltetrahydrobenzene) (*ibid.*, p. 124), its formation by loss of hydrogen bromide necessitating the wandering of a methyl group from carbon atom 1 to carbon atom 2:



(3) There has been isolated from the action of phosphorus pentabromide on dimethyldihydroresorcin a monobromoxylenol melting at 103°. Although the constitution of this substance has not been proved by synthesis, it would appear to be a derivative of *o*-4-xylenol, because on further treatment with bromine it gives a tribromoxylenol, and from this an acetyl derivative, the melting points of which are not lowered on admixture respectively with tribromo-*o*-4-xylenol and its acetyl derivative.

In this rearrangement, therefore, a methyl group has again

wandered into an ortho-position but from carbon atom 1 to carbon atom 6, instead of carbon atom 2:



The work is being continued, and it is hoped shortly to communicate more detailed accounts of these transformations and of the nature of the resulting products, for which purpose the synthesis of a number of bromoxylenols is being carried out.

336. "Non-aromatic diazonium salts. (Preliminary note.)"
By Gilbert T. Morgan and Joseph Reilly.

The authors have investigated the degree of diazotisability of the following partly aromatic and non-aromatic amines: 4-aminoantipyrine, 6-amino-2:4-dimethylpyrimidine, 4-amino-3:5-dimethylpyrazole, 4-amino-1:3:5-trimethylpyrazole, 2-amino-6-oxypurine (guanine), and aminomethyltriazole.

When 4-aminoantipyrine hydrochloride is diazotised with ethyl nitrite in alcoholic solution without excess of mineral acid an uncrystallisable, resinous product is obtained on concentrating the solution. With excess of acid a crystalline diazonium *hydrochloride* is produced, which after prolonged drying in a vacuum over potassium hydroxide corresponds with the formula $2C_{11}H_{11}ON_4Cl,HCl$. The *platinichloride*, $(C_{11}H_{11}ON_4)_2PtCl_6$, the *aurichloride*,

$$(C_{11}H_{11}ON_4)AuCl_4,$$

and the very explosive *dichromate*, $(C_{11}H_{11}ON_4)_2Cr_2O_7$, have the normal composition.

Although possessing a chemical constitution closely allied to the aromatic amines, 6-amino-2:4-dimethylpyrimidine is not diazotisable under the ordinary experimental conditions, and prolonged treatment with nitrous acid leads to the formation of the corresponding 6-hydroxy-2:4-dimethylpyrimidine.

4-Amino-3:5-dimethylpyrazole gives rise to diazonium salts as stable as those of 4-aminoantipyrine, and these substances are being investigated, together with those of 4-amino-1:3:5-pyrazole.

2-Amino-6-oxypurine does not diazotise under conditions which readily give rise to diazonium salts in the case of aminomethyltriazole.

The next Ordinary Scientific Meeting will be held on **Thursday, January 23rd, 1913, at 8.30 p.m.**

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